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ABSTRACT

This 7-chapter volume presents 11 papers dealing with the issues commonly encountered by educators and decision-makers in less developed countries when they consider the use of mass media to further their country's education and development. Individual topics and their authors are (1) "Marshalling, Managing, and Evaluating the Mass Media for Education and Development," by Shigenari Futagami; (2) "Do Audiovisual Media Possess Unique Teaching Capabilities?" by Janet Jenkins; (3) "The History of Nation-Building and the Future of Local Broadcasting," by Shigenari Futagami; (4) "Networking and Local Broadcasting: A Choice?" by Gloria Feliciano; (5) "Local Broadcasting and Community Media," by Alan Hancock; (6) "Can Mass Media Be Effective in Curriculum Improvement?" by Takashi Sakamoto; (7) "How Can Radio Be Usefully Applied to Education and Development?" by Hilary Perraton; (8) "Choosing Instructional Languages for Educational Radio Broadcasts in Less Developed Countries," by Wallace Lambert and Nelly Sidoti; (9) "What Does Educational Television Offer Us Now?" by Albert Horley; (10) "Photovoltaic Power for Communications," by Gerald Hein; and (11) "Selecting Appropriate Media," by John Tiffin. (LMM)

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The Educational Use of Mass Media

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World Bank Staff Working Paper No. 491

October 1981

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WORLD BANK

Staff Working Paper No. 491

October 1981

THE EDUCATIONAL USE OF MASS MEDIA

This volume is composed of an introduction and seven chapters, all of which are relevant to the educational use of mass media in Less Developed Countries (LDCs). Each chapter deals with one of the salient issues that LDCs educators and decision-makers inevitably encounter when they think about using mass media to further the country's education and development. These problems are:

(1) the actual potentialities of audiovisual media,

(2) the choice between or combination of network broadcasting and local broadcasting,

(3) the use of educational mass media for curriculum improvement,

(4) the impact of radio on education and development,

(5) the choice of language(s) for instruction and radio's role in language teaching;

(6) the possible expansion of educational TV in the 1980s, and

(7) the appropriateness of each medium for use in LDCs.

The original contributions were slightly modified and shortened.

It is hoped that this paper will contribute to the improved use of mass media for the cause of better education and more efficient development in the third world.

Prepared by the following consultants:

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PREFACE

Hundreds of handbooks on educational mass media have been published since mass media's potential for spreading information and furthering education and development first became apparent. Most such books are concerned mainly with know-how--with the production of film, radio, TV, and other audiovisual material. But very few authors have adequately addressed the applicability of such new media in the Less Developed Countries (LDCs), nor have many educators themselves been motivated enough to express positive interest in making the fullest use of mass media for education in LDCs.

At the same time, educators and communication specialists do recognize that the use of mass media in education and development must differ according to the conditions and background of each country. Obviously, the media approaches taken in LDCs must vary significantly from those adopted by countries with more developed and supportive infrastructures. In fact, it is the LDCs, rather than the industrialized countries, that most need educational mass media given the persistent shortage of qualified teachers in the developing world. As the World Bank's Education Sector Policy Paper (April 1980) points out:

> The desire for improvements in the quality of education has clearly increased, but serious problems in implementing innovations remain. Serious efforts are expected to be made during the next several decades to make education systems genuinely relevant. Measures will include the designing of new curricula and syllabi, the production and distribution of better learning materials, the training of teachers in new modes of education, the use of local languages wherever possible, and--most important--the development of a national capacity for the analysis, design, and management of an education system. (Emphasis added.)

Thus, while LDCs need to make innovative use of educational mass media, direct guidance that goes beyond technology assessments is scarce. It is to fill this gap that these essays have been prepared.

As technology evolves, educational mass media become more and more accessible to LDC educators. However--a point often made--the educator is not necessarily ready just because the educational technology is. For this reason, this volume is not meant to be another how-to-do-it guide. Instead, its aim is to enable educators and policymakers, particularly those in LDCs, to make wise decisions on mass media use.

Aklilu Habte
Director
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THE EDUCATIONAL USE OF MASS MEDIA

TABLE OF CONTENTS

		Page No.
OVERVIEW	MARSHALLING, MANAGING, AND EVALUATING THE MASS MEDIA FOR EDUCATION AND DEVELOPMENT (by Shigenari Futagami) ..	1
CHAPTER I	DO AUDIOVISUAL MEDIA POSSESS UNIQUE TEACHING CAPABILITIES? (by Janet Jenkins)	11
	Multi-media Education	12
	Media to Improve or Extend Education	13
	Which Media?	15
	Sound Cassettes	17
	Television	18
	Closed-circuit Television and Video Cassettes	21
	Satellites	22
	Film	22
	Still Pictures	22
	When Are Media Useful?	23
	Future Developments	24
CHAPER II	NATIONWIDE NETWORKING OR LOCAL BROADCASTING?	26
	1. THE HISTORY OF NATION-BUILDING AND THE FUTURE OF LOCAL BROADCASTING (by Shigenari Futagami)	26
	Geographical Conditions	26
	Impact of Religion	27
	Communal Cooperation	27
	Political Framework	27
	Consciousness of Progress	28
	Military Needs	29
	Commercial Cities	29
	Local Development and the Notion of Nation	29
	The LDCs' Local Economies	30
	Mass Media's Roles in Local Development	30
	2. NETWORKING AND LOCAL BROADCASTING: A CHOICE? (by Gloria Feliciano)	31
	Networking Versus Local Broadcasting	31
	National Networking in Relation to Local Broadcasting	33

Page No.

3. LOCAL BROADCASTING AND COMMUNITY MEDIA
(by Alan Hancock) 35
From Local Broadcasting to Rural Development 35
The Forum Model 36
The Radio Schools 37
Access and Participation 37
Community Media in the Industrialized World 38
The Problem of Development 39
Community Media in the Developing World 40
Beyond Community Media--Bridging the Gap 42
The Contribution of Technology--Moves Toward Self-Reliance 43

CHAPTER III CAN MASS MEDIA BE EFFECTIVE IN CURRICULUM IMPROVEMENT? (by Takashi Sakamoto) 45

Media-based Teacher Training for Curriculum Improvement 49
Recommendations 50

CHAPTER IV HOW CAN RADIO BE USEFULLY APPLIED TO EDUCATION AND DEVELOPMENT? (by Hilary Perraton) 53

Can Radio Teach? 53
A Multi-media Approach 54
Broadcasting for Development 55
Open Broadcasting 56
Open Broadcasts with Print 58
Broadcasts with Print and Feedback 59
Broadcasts with Print for Groups 60
The Function of Broadcasts 62
Formats 63
Costs 66
Conclusions 70
Bibliography 72

CHAPTER V CHOOSING INSTRUCTIONAL LANGUAGES FOR EDUCATIONAL RADIO BROADCASTS IN LESS DEVELOPED COUNTRIES (by Wallace Lambert & Nelly Sidoti) 74

A Rationale for Giving Advice to LDCs 74
Social and Psychological Considerations 75
General Principles 77
Sociological Constraints 78
Educational Constraints 79
Prototype Cases 80
Guidelines for Selecting Languages of Instruction 84
Fixed Versus Open-Language Policies 86
A Plan for Selecting Languages of Instruction 86
The Role of Radio in Language Learning 87
Using Radio in Language Instruction 88
Bibliography 90

Page No.

CHAPTER VI	WHAT DOES EDUCATIONAL TELEVISION OFFER US NOW? (by Albert Horley)	94
	New Video Technologies	95
	Conclusions	99
APPENDIX TO CHAPTER VI	PHOTOVOLTAIC POWER FOR COMMUNICATIONS (by Gerald Hein)	100
	What Are the Components of a Solar System?	100
	What Are the Costs of Communications Applications of Solar Cells?	102
CHAPTER VII	SELECTING APPROPRIATE MEDIA (by John Tiffin)	105
	Conventional Forms of Instruction	105
	The Media of the Communications Revolution	108
	Electronic Media and the Three Basic Modes of Learning	112
	The Need for Research and Development	115
	Recommendations	117
	Bibliography	121
LIST OF CONTRIBUTORS*		122

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* This volume was edited by Kathleen Courrier.

OVERVIEW

MARSHALLING, MANAGING, AND EVALUATING

THE MASS MEDIA FOR EDUCATION AND DEVELOPMENT*

Critics are divided on the question of mass media's impact. Some say that mass media, especially broadcasting media, have greatly influenced audiences, especially young ones, making them more aggressive or easier to distract, or capable of responding fully only to quick sequences of visual signals. Others contend that the use of mass media for education has not remarkably improved viewers' or listeners' scholastic achievements. At first glance, it seems as though one camp must be right, the other wrong. But a closer look reveals other possibilities. Could it be that the mass media are more effective in influencing attitudes than they are in influencing cognitive achievements? Or that a media program could directly boost cognitive achievements if it were designed carefully enough?

Even if the answers to these questions are not self-evident, one thing is--the mass media are powerful. As merchandisers know, the media's power to influence consumers' behavior is indisputable: sales improve after products are advertised on TV or radio. Still, educators and extension workers have thus far seldom applied these same powerful technologies to education and development, and when they have the results have rarely been as unambiguous as they are in advertising. Why? While the technology is ready, most countries have simply not been able to make the best use of it for education.

What has kept educators from using the mass media to maximum advantage? Sporadic use is one problem. Particularly in industrial countries with well-established school systems, educational technologies tend to be introduced as supplementary tools. Added on instead of integrated, they thus cannot exert their full influence. In Less Developed Countries (LDCs), this lukewarm approach has been adopted wholesale, even though it is doubly inappropriate in countries without well-established educational institutions. Inevitably, frustration ensues--as it did in some of the countries in which the World Bank's earliest education projects took place. Government efforts to use the media solely to enrich classroom teaching cannot come to much if there is little classroom teaching to enrich. Clearly, a different approach is needed--one in which the instructional media can be integral teaching tools.

A second stumbling block to the effective use of the mass media for education is inefficient management. The lack of effectiveness of the educational mass media, particularly in some LDCs, is due in part to a lack of management skills. Sorely needed are LDC people trained to adapt media operations to each LDC infrastructure. Even well meant, well thought out, and comprehensive instructional TV projects can fail if the new technology is introduced prematurely.

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* This chapter was written by Shigenari Futagami.

A third problem is insufficient evaluation. Managers of projects involving the electronic media are more often required by project sponsors to produce quantitative evaluation data than are those who oversee the construction of new schools, teacher-training institutions, or, say, the introduction of new textbooks. This rather constricting vigilance will probably be relaxed once the temporary novelty of educational media wears off, once the lingering but ungrounded fear that media may replace teachers is dispelled, and once the belief that the capital and operating costs associated with the use of the electronic media are always excessively heavy is proven unfounded. But while these misconceptions and half-truths will gradually fade, they remain serious problems. For now, the continuing challenge is to evaluate media's impact on education and development so that more viable projects can be formulated as follow-up. Without question, some of the unintended results of the educational use of the mass media in the past stemmed from a lack of reliable plans for evaluating media-related projects, both during and after completion.

These difficulties have, of course, been identified before. Indeed, most of the media-related projects mounted during recent years have been designed precisely to cope with the problems earlier projects encountered, and how successful media projects in the 1980s will be depends on how effectively they build on past experience.

The obvious solution to the problems caused by sporadic use is to concentrate the use of the media. Less obvious perhaps is the need to use the media for curriculum improvement. A successful project is a dynamic one, and the strategic use of the media can bring about the needed momentum. Japan's elementary science TV series has so successfully brought the country's best resources to bear on program production that it has triggered a pioneering science-curriculum reform in Japan. Such concentrated efforts do not always require a nationwide broadcasting network, nor do they need to involve more than one school subject. For instance, the highly successful and widely replicated Radio Mathematics Project in Nicaragua focussed on primary-level math only.

The World Bank's projects in Malaysia, Thailand, and the Philippines are drawing from these earlier projects--the common feature of which is the close connection of educational broadcasting with curriculum improvement. To be truly effective in the classroom, instructional broadcasting programs must involve (and, hence, invest in) curriculum development, textbook improvement, and teacher training. The idea is not to add on the educational media but to use them to upgrade the total educational experience.

Better management, the second imperative, means better integrating the implementation of curriculum improvement, educational materials production, teacher training, and, in some cases, textbook revision. Naturally, this approach requires a dedicated staff, which may in turn require technical assistance. Here too, the lukewarm use of the educational media causes problems since it can engender no more than lukewarm management and the lukewarm participation of teachers.

Objective evaluation, the third imperative, will also require more than a lukewarm commitment, since effort and concentration are needed to

identify clear-cut objectives and target audiences--the prerequisites of objective evaluation. When both are well defined, even negative feedback can help the project staff members improve the project. Even more important, the presence of clearly defined objectives and targets makes it easier for an efficient and powerful management to develop.

To define these objectives and targets, decision-makers in a media project need to address various fundamental matters of education and culture. Two of the most vital are the choice of languages to use for instruction and the extent to which national unity exists. After all, educational technology is at base simply a tool used in education and development, and this technology can be molded to meet the users' needs. Regrettably, few project decision-makers have so far paid much attention to these two basic conditions, which inevitably determine the type and scale of media best suited to local needs.

The selection of teaching languages involves various kinds of problems. In Indonesia, radio programs are broadcast for adult education and public information in an official language that remote villagers cannot understand. In contrast, in Uganda, rural elementary schools accept pupils from several language groups, and the schools obviously cannot afford to provide pupils with lessons in all of these languages. In addition to these tactical problems are more basic psychological, sociological, and economic ones. Should the language in a child's family and the one in his primary school be the same? Does the use of a lingua franca oppress spontaneous communication in rural societies? Will reducing the number of official languages eventually prove cost-effective?

Answering these and other relevant questions requires careful research. But no matter what answers research data suggest, it can be accepted as fact that instructional technology is quite versatile in responding to demands. For example, simultaneous radio transmission can solve some of the problems of the polylingual classroom: audio multi-channel equipment can be easily attached even to TV transmitters. Alternatively, if a project is to be conducted in selected common language(s), network broadcasting may be the logical technological choice.

The second question--whether both national unity and local development can be nurtured simultaneously by the mass media--is at once delicate and important. Here, Ghana's Northern Region Development Project stands as a noteworthy case study. The Government started this integrated development project in the economically sluggish Northern Region to improve various sectors--agriculture, marketing, land development, livestock husbandry, nutrition, and adult education--and a new FM radio network is being built to broadcast programs in several local languages throughout the region. Should the approach taken in Ghana serve as a prototype for adoption by other countries, or should the goal of nationwide development instead take priority over that of local development? Most countries set up an education ministry that controls the nationwide educational activities, but is the concept of a "nation" a priori?

History tells us that the modern (post-feudal) nation emerged only after local communities had matured socially and economically, and in many nations even today the central government in a capital exerts little felt influence over the farmer in the village. Can media bridge this unfortunate gap? Even if they can, is the greater challenge to use the media first of all to help local governments build up a community-based infrastructure? Isn't concern about the lack of management skills among government staff in an educational project pointless if the novelty of nationhood itself (and the whole country's lack of an organizational structure) is the root problem? Can media help a country establish the social and psychological structure that true unity demands? And, further, is building this structure best accomplished by emphasizing national homogeniety or by stressing community development? Indeed, is there a way to apply both approaches concurrently?

Again, these are not questions for media specialists to answer, and yet knowing the answers will help them make wiser choices of educational technology. If, for instance, frequent contact between a capital and a rural institution is vital to a project's implementation, a two-way link between the two should be established. If, to use another example, a government considers TV to be an effective tool for achieving national unity, that government should increase the availability of TV facilities, taking advantage of various types of satellites and newly improved solar-cell batteries for TV reception. If, in a third case, a government chooses to back local development, it should invest in compact local radio stations with studios. In all three instances, success depends on having the technology ready when users are ready, on defining the target audience carefully, and on clarifying from the start the development goals the media are to serve.

To reiterate, the mass media in both formal and nonformal education are versatile tools. In formal education, broadcasts and printed materials used together can enhance the classroom experience by giving pupils carefully designed instruction and following up new curriculum and, at the same time, by helping teachers both improve their techniques and master new curricula. This quadruple impact in the classroom is important since roughly a decade is needed to design and disseminate a new curriculum, by which time most of its components will again need to be reworked. The mass media can be used to introduce new material, to prepare teachers to present and follow up on this material, and to institutionalize curriculum innovation.

This extraordinary potential of the mass media must, of course, be viewed against the extraordinary social challenges of the 1980s. School-age populations in LDCs will increase dramatically in the coming decade, and mere survival demands that both rural and new urban populations acquire a practical understanding of the food-production and distribution system, environmental protection, urbanization, alternative energy sources, family planning, and community self-reliance. Yet, as vital as this practical education is, its impact can take generations to assess, and some LDCs cannot justify on strictly economic grounds even universal primary education as essential to their development, much less the introduction of a new curriculum or the creation of an educational radio network.

Clearly, the economic and social benefits of investing in educational media need to be assessed over the long, as well as the short, term. The impact of education and information dissemination upon the country's long-term development must be given more consideration than it usually is now, and the long term should for planning purposes be taken to mean at least half a century. Historical reflection at this level unveils a country's social, cultural, and economic contours in a way no other approach can. For instance, it is impossible to understand the influence of the distorted monocultural pattern of agriculture becoming common in many LDCs unless its origin centuries ago in the colonial economy is grasped. Before the Western nations colonized the Americas, Africa, and Asia, many regions on these continents may have had more balanced environments and self-sufficient production systems than they do now. Thus, while the economic model of modern mutual dependency must be recognized, so must the fact that an analysis of an LDC economy that goes back no farther than World War II cannot fully explain the workings of the indigenous economy and culture. Education, language, peoples' awareness, attitudes, social dynamism within the context of a unified and viable economy--all of these should be considered from historical, sociological, and ecological points of view. In short, to get direction for the 1980s, we must look forward half a century and backward for several centuries.

This volume on the educational use of mass media is meant for use in this effort to inform action with knowledge of the past and a sense of the future. It is not meant to be comprehensive, but rather to highlight for decision-makers the key questions surrounding the educational use of mass media. The belief embodied in these seven essays is that LDC decision-makers can maximize the impact of their countries' investments in educational mass media if they know which questions to ask as they weigh and size the investment. In the order discussed, the key questions are:

(1) Do audiovisual media possess unique teaching capabilities?

(2) Is nationwide networking or local broadcasting most effective?

(3) Can mass media be effective in curriculum improvement?

(4) How can radio be usefully applied to education and development?

(5) What are the most appropriate languages of instruction (with specific reference to radio)?

(6) What does educational television (ETV) offer us now?

(7) How do we select the most appropriate media?

1. Do Audiovisual Media Possess Unique Teaching Capabilities? (by Janet Jenkins)

Any serious discussion of the mass media in education must take into account the respective characteristics of audio only, visual only, and audiovisual presentation.

Phototelegraphy conveyed via facsimile or still-picture TV will be used more frequently in the near future than it is now. But this and other electronic media used merely as substitutes for print media, some evidence suggests, may be less effective than moving pictures accompanied by an explanatory narration that includes inquiring comments, especially in the teaching of science, mathematics, and social studies. A conspicuous example is using animation to explain the composition of a molecule--what other means could have such powerful effects? Or take the example of a social studies curriculum aimed at defining the nature of man as a species and at identifying the forces that shaped his humanity; an ethnographic film based on field research data is probably the optimum media choice. In contrast, for subjects such as elementary mathematics, the simpler medium of educational radio may be LDCs' best choice since live or taped radio broadcasts can easily be combined with visual materials distributed before the programs are aired.

2. Nationwide Networking or Local Broadcasting? (by Shigenari Futagami, Gloria Feliciano, and Alan Hancock)

This question relates directly to that of how radio can serve the basic requirement of language teaching in a community or a nation. In Chapter II, not only languages but also the wider spectra of community life in LDCs is considered. As Shigenari Futagami argues, no nation can function, much less prosper, unless its local components are cohesive. Most people in rural areas gradually come to understand the nation as the extension of each community only after grasping the concept of group life at the community level. Will local and network broadcasting contribute much to a nation's progress through this important recognition process?

Effective adult education seems to require that local programming be both various and full of familiar objects, people, and places. Does school broadcasting also need local programming? Perhaps it does, at least for some subjects, though the jury is still out on this question. Meanwhile, some relevant historical patterns have been observed. One is that, if a nation is too centralized, local districts become frustrated when a country's political and economic activities do not draw adequately upon local resources and, as a result, the rural village economy stagnates. This frustration can widen existing gaps between the ruling and ruled, and give impetus to youth's exodus from rural areas.

Most of today's industrialized nations developed only gradually, promoting local culture and industries through trial-and-error during the feudal ages. Assemblages of local communities became self-sufficient modern nations through a process we cannot expect emerging nations to repeat now. On the other hand, there may be no short cut to development, no way other than to raise each community's consciousness slowly. Thus, each community must recognize its own unique identity, its development potential, and then its function and place as part of a nation. This basic understanding of one's own community as a political and economic entity should be the start of a nation's healthy development. As is argued here, local daily radio broadcasts may be the best means of fostering this basic "community" feeling. Radio broadcasting can be very flexible, forming a global network or binding a handful of people.

Financially, Gloria Feliciano explains, it is more expensive for a country to have numerous local stations than to operate one nationwide network. Particularly in the case of TV, even industrialized countries cannot easily afford to fill up local air time with locally produced programs. In contrast, radio broadcasting from local stations can be relatively inexpensive.

As Alan Hancock explains, a recent trend that augurs well for radio's future is the gradual shift of radio broadcasting from AM to FM. A medium-sized (1 to 3 kilowatt) FM transmitter is sturdy and needs few operators. It costs less than US$200,000 and lasts more than ten years. Simple program facilities that cost no more than US$50,000 may be all that are needed to develop programs using villagers' own voices. Moreover, the unit costs of FM transmitters and receivers will be reduced as demand increases. At the same time, medium-wave transmission could be expanded in many countries, and a hybrid system combining network operation with local FM transmitters could fill in the gaps.

The appropriate use of other compact audiovisual devices, together with broadcasting media, will greatly strengthen each community's efforts to move toward self-reliance.

In sum, local broadcasting can contribute mightily to a country's sense of nationhood, and broadcasting facilities may well be within the economic reach of most LDCs.

3. Can Mass Media be Effective for Curriculum Improvement? (by Takashi Sakamoto)

This question is in a sense a reiteration of the first, but it warrants separate treatment because most policymakers who make decisions about educational mass media treat the media programs as sporadic input for enriching conventional teaching activities. Too seldom do they understand the media's full potential.

Now that scientific data doubles every ten years, curricula must be greatly modified and updated continually, not once in a generation. School-teachers are supposed to stay abreast of new developments in their field, but even qualified teachers in developed countries cannot always keep up with curriculum revisions. Some do not possess the new knowledge; and some may actually be the victims of their own training, discovering the hard way that the pedagogy they mastered cannot accommodate new curricula. Even the best teachers will become unqualified in, say, ten years to present the newest data. Thus, the quantitative shortage of teachers is exacerbated by the qualitative shortage of adequately trained--or retrained--teachers.

Dedicated teachers are always eager to return to the basic question of what to teach and how, particularly in this age of the knowledge explosion. They cannot depend solely on the Ministry of Education's decrees, its guide-lines, textbooks, and sporadic refresher training courses for answers to those questions. Practical advice on classroom teaching is needed all year round. Perhaps better than any of these other approaches to helping teachers adjust,

radio or TV school broadcasting can daily provide new prototype lessons along with the new curricula. Such media-based programs both directly teach pupils in the classroom and train the teacher on the job. The teacher can also treat the radio- or TV-teacher as his colleague in team teaching, a specialist in a subject the students are mastering and the classroom teacher is learning to present.

Of course, in any educational broadcasting project, the program contents determine the project's long-run success or failure. Here, educational broadcasting's unique capability to concentrate national resources for the production and dissemination of the best available teaching materials is of key importance, especially when program production is interwoven with curriculum reform. Curriculum improvement requires simultaneous modification of both teaching methods and teaching materials, and school broadcasting programs can ease both transitions. Designed to give systematic serial instruction to classroom students and to reinforce broadcasts that embody the government's curriculum changes, school broadcasting programs and support materials can in some instances even substitute for teachers' guidelines to new curricula or for students' textbooks.

4. How Can Radio be Usefully Applied to Education and Development? (by Hilary Perraton)

This question too harks back to the first. But radio merits a closer look since the World Bank has so far sponsored three studies on radio's role in improving both formal and nonformal education and since educational radio is inexpensive and able to reach both remote and large audiences.

With respect to formal education, radio's potential is best gauged in terms of the findings of the World Bank's two studies--"Radio for Education and Development" and "Distance Teaching for Formal Education." In these two papers, the education projects' shortcomings and successes are treated in detail, with a special emphasis on the combined use of radio and printed media.

With respect to nonformal education, the Bank's "Mass Media and Rural Education" project gives the best answer to the question of radio's potential. While only the preliminary studies conducted as part of this project are now ready, these findings are included in this volume. Particular consideration is given to the roles of mass media for agriculture, population, and nutrition programs, and to the final report of Unesco's International Commission for the Study of Communication Problems (commonly known as the McBride Commission Report), a report that is sure to influence many LDCs' communication policies.

5. Choosing Instructional Languages for Educational Radio Broadcasts in Less Developed Countries (by Wallace Lambert and Nelly Sidoti)

This question is among the first and the most important that education sector policymakers must confront. If a project is aimed at adults, the teaching languages should probably be indigenous. The selection of teaching

languages exerts equal, or perhaps more serious, influence on formal education. Should the coming generations be taught in English, French, Spanish, another lingua franca, or a local language? At stake here is not only the individual's communicative competence, but also the nation's culture.

Educational radio can be used both to unify a nation linguistically and to reinforce local indigenous languages. Many decision-makers now support the appropriate use of local languages, but whether, how, and when are complicated matters for linguists, educators, and sociologists to decide jointly. In any case, radio and other audio teaching aids have a unique role in the oral instruction of languages--no language can have full social or cultural significance unless it is spoken well.

6. What does Educational Television Offer Us Now? (by Albert Horley and Gerald Hein)

Thanks to accelerated technological progress, says Albert Horley in this chapter, educational TV will be brought within the reach of most LDCs during the 1980s--but not, of course, without some problems. TV's most serious drawback is its costliness. Particularly troubling are high operating costs, which cannot be easily offset even by TV's value in disseminating sound and moving pictures to every corner of the nation. Transmission costs, in contrast, are not high once an educational TV (ETV) organization establishes an efficient network system, while program production costs are falling as smaller and more efficient video facilities become available. For both program production and transmission, the cost difference between color and black/white operation has become slight. A final consideration at the reception end is that while technical progress has made TV receivers more stable, thus alleviating maintenance problems, access to power for receivers remains an important problem for any ETV project in an LDC. If this problem is solved by, for example, the use of solar-cell batteries, ETV may well enter into a new era of expansion.

Communication satellite technology is expected to make ETV coverage more feasible for dispersed populations in rural areas than it now is. Indeed, as Gerald Hein suggests, the combination of communication satellites with receivers run by solar energy may vitalize ETV in some LDCs. But for the coming decade, transmission via satellite will not suit local ETV broadcasting aimed at relatively small areas.

A new electronic device for audiovisual playback, video discs, may eventually replace video cassettes and even printed media as the means for data retrieval. (A simple player now costs less than US$500; a mass-produced disc costs less than US$15.) However, this system does not permit users to record signals on the spot nor at the receiving terminal of TV transmission, so videotape recording will remain an important medium for data recording and playback. Because cost breaks and technological advances bear so directly on the future of ETV in LDCs, educational technology must be reassessed at regular intervals with a mind to how new developments will affect ETV's power and reach.

7. How Should We Select Appropriate Media? (by John Tiffin)

To answer this question, readers must draw on all six foregoing chapters. In this chapter, the approaches suggested and recommended throughout this volume are re-examined in terms of media functions and equipment costs. One principal conclusion is that the intermittent use of broadcasting media can leave unjustified a comparatively heavy initial investment and also fail to make the most of the intrinsic advantages of print and broadcasting media. But with full and systematic use, the reverse is true.

In the final chapter, particular attention is also paid to the potential educational use of computers. Microcomputers, which will be within the reach of most villages in the 1980s, could revolutionize education the world over. Easily linked with audiovisual retrieval and playback devices, microcomputers will give learners new interactive channels of access to instructional resources. This development will eventually make meaningless the distinction between formal and nonformal education.

CHAPTER I

DO AUDIOVISUAL MEDIA POSSESS UNIQUE TEACHING CAPABILITIES?*

Audiovisual media are seldom used to replace conventional teaching completely. Instead, they are generally used to complement or supplement face-to-face instruction. No discussion is needed here on the casual use of audiovisual media to enrich teaching. But a review of the practical economic and educational arguments for the more substantial and organized use of media in education is needed.

Media have often been used in both formal and nonformal education to attack problems of quantity, quality, and access. Their use can enable countries with a shortage of teachers to extend schooling to greater numbers. In several countries, television or radio have (together with printed materials) been used to teach children in schools where trained teachers are not available, or to train teachers themselves. Media can also be used to enhance the quality of teaching. The best teachers can be selected to teach a class of thousands through the media, and they can introduce new teaching methods and new curricula to the classroom.

Two additional advantages also follow from the use of media in schools. First, teachers can be trained and teaching methods or curricula can be introduced much more rapidly and insistently by media than by conventional methods. With media, a new curriculum can be introduced immediately in schools and the teachers trained simultaneously. Second, media can bring high-quality education to those marginal communities that are so often the last to benefit from the expansion of conventional education.

In nonformal education, too, audiovisual media can extend more and better teaching to many more people than teachers alone can reach. (Since adult education services are usually considerably less developed than schools and universities, media's contribution is all the more important.) Broadcasts have proved particularly effective in attracting people to adult education. Audiovisual media linked with print can also train at a distance those adults who require vocational, technical, or professional training or general education but who cannot attend classes.

Audiovisual media need not be seen as merely a temporary expedient to solve educational problems. Media-based education can also be cheaper than the conventional alternative. In formal education, the purchase of media equipment may initially entail high costs, but as greater numbers of students are taught (and taught better so that more of them progress successfully through the system), the costs per successful student decrease and can fall below those of conventional education. In nonformal education, cost-effectiveness is usually more difficult to measure since points of comparison with formal education or a nonformal alternative are difficult to define. Yet, evidence suggests that the costs of such education can compare favorably with those of conventional education.

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* This chapter was written by Janet Jenkins.

Education using audiovisual media is usually at least as effective as conventional education. It has long been established that radio or television can teach as effectively as the class teacher. Chu and Schramm's 1968 comparative survey of hundreds of examples of television teaching and classroom teaching found no significant difference between television and class teaching.

Other research has shown that where controlled comparisons of different media are made, differences between results are insignificant. In the most thorough study of this kind, Trenaman compared radio, television, and print presentations of the same subjects to the same audiences of adults and found no significant differences. His finding is of profound importance for education since it demonstrates convincingly that we need not regard any one medium as inherently superior to any other. Thus, educational planners can take as their starting point the assumption that each medium can teach as effectively as a class teacher or as any other medium.

Differences in subject matter and in audience are more important than differences in media to the success of an educational program. Some subjects lend themselves more easily to one medium than another, or are difficult to teach at all through media. Similarly, some audiences will be more attracted or used to one medium than another. Effectiveness also depends on the quality of support given to teaching through media. In formal education, teachers need to be trained to use media in the class to best advantage. In nonformal education, learners require adequate support, which may include the organization of study groups and back-up services (such as distributing agricultural supplies locally as part of an agricultural project). To decide, therefore, if or when to use audiovisual media, it is necessary to examine the advantages, disadvantages, and overall suitability of each within a particular context and for a particular task.

Multi-media Education

Strong arguments exist for using more than one medium in an educational effort. A typical combination is that of broadcasts, print, and face-to-face study. Any one of these might carry the main teaching burden, supported by the other two; or each might be equally important.

Learning theory supports the case for multi-media education, as this hybrid approach is called. Normally, people do not remember and learn everything they experience, but instead select important or interesting points to learn. Teachers normally guide this selection by emphasizing the most important issues. One method is to present a point twice, but simple repetition can become boring and decrease motivation. But having access to two different media enables the teacher to present the same point in different ways with different emphases. Moreover, students are more likely to remember if they are given the chance to put into practice what they have just learned. Teaching should, therefore, be alternated with exercises and activities, and the integrated use of more than one medium can usually offer the teacher a wider and more varied choice of options for activities. Finally, using more than one medium will generally satisfy both those with preferences for verbal instruction and those who prefer visual instruction.

Communication theory also supports the case for multi-media education. Research shows that people readily note information from a single source. But they are far more ready to act on that information if it comes from more than one source, particularly if they have the opportunity to discuss the information with other people. The classic experiment that established this fact was concerned with changes in diet among American women during World War II. Those who heard a lecture and then discussed it were more likely to purchase and cook cheaper cuts of meat than those who simply heard a lecture. Subsequent research has confirmed that there are generally two or more steps between information and action. Relatively few people will make changes on receipt of information alone. Recent attempts to use radio "advertisements" alone to bring about changes in diet in Less Developed Countries (LDCs) have, for instance, had a very limited impact.

Multi-media teaching offers students various ways of learning, and this variety entails certain advantages. One is that a student who misses a class or broadcast can usually catch up by other means, such as print. Continuity is not lost even if part of the course is only cursorily studied. Another is that multi-media teaching also increases the more disadvantaged students' chances of equal participation. In school, all students can listen to and discuss broadcasts, even if the weaker ones cannot cope well with all follow-up activities. Out-of-school adults, be they illiterate or literate, can benefit equally from broadcasts and discussions.

Multi-media teaching also treats many subjects more effectively than single-medium or conventional teaching does. For practical scientific work, an experimental procedure can be described in print with words and diagrams. A television demonstration to support the print will, however, eliminate the need for a detailed description and dispel ambiguities in the presentation. Alternatively, the curriculum may be arranged so that only simple practical work is taught using media. In the humanities or social sciences, most teaching can be print-based, but broadcasts can be used to stimulate imagination or debate, often more effectively than print can.

Finally, while one medium alone can in theory teach effectively, in practice, few people can follow a sustained course of study without some variety or some face-to-face contact. In correspondence study, for example, 50 percent or more of the students who enroll normally drop out before completing their courses. Those who study at home with broadcast support or attend occasional seminars are more likely to complete their courses than are those who learn from printed lessons and correspondence alone.

Media to Improve or Extend Education

It is useful to distinguish between the use of audiovisual media as an adjunct to orthodox teaching to raise the quality of education and their use for extending education to students who would not otherwise have access to it. In formal education, the media have been used over the last twenty years not simply to aid teachers but also to teach children directly. In Thailand from 1957 and in Nicaragua from 1975, for example, radio has been used to teach in primary schools. Similarly, television has been used to improve teaching in some subjects (as in Colombian primary schools from 1964) or in all

subjects (in both primary and secondary schools in American Samoa from 1960). Such projects have been reasonably successful educationally, and most have sustained their momentum over several years. Their relative success or failure has been largely due to organizational problems, in particular the lack of sympathy or the outright hostility of teachers or education officials who feel threatened by the presence of media in the classroom.

Media have also been used to create new schools and to facilitate the rapid expansion of existing schools. Most such projects have used television at the secondary level. One of the most successful and simplest of these is the Mexican Telesecundaria, in which rural children with no access to a conventional school are taught by television. The television teacher presents the lesson much as a schoolteacher would, the children use standard textbooks, and they work under the guidance of a trained coordinator. Similar schemes at the primary level, two using radio in Mexico and an ambitious one using television in Niger, have been less successful. Other larger projects, such as the television schemes in the Ivory Coast and El Salvador, have used television to combine curriculum reform with the expansion of both primary and secondary schooling.

In nonformal education, a growing number of educators use media to support face-to-face teaching. Films, slides, booklets, and other aids have an established place now in education, health, nutrition, and family planning. Radio or, less often, television is also used, either to provide regular programs (as in the Radio School for Family Education in the Dominican Republic, which provides daily programs on health and family planning) or to provide publicity or support for a campaign (such as the 1974 breastfeeding campaign in Trinidad and Tobago). In agricultural extension work, farm broadcasts are widespread, and many are highly valued. In Northern Nigeria, for example, a survey found that over half the farmers considered radio their prime source of information on agricultural topics. In some cases, agricultural extension agencies have tried to build up a more closely integrated relationship between the activities of field workers and media support. In Malawi, for example, the Extension Aids Department provides broadcasts, films (circulated in mobile film units), and booklets, all linked to the work of agricultural demonstrators. In literacy work, radio is often used to attract students or volunteer tutors. In rural Ecuador, comprehensive nonformal education services rely on trained local people to organize village activities with the assistance of radio programs, cassette tape recorders, games, and photostrip booklets.

These strides notwithstanding, it is in the extension of educational opportunities to out-of-school adults that the contribution of audiovisual media to nonformal education is most spectacular. The media, particularly radio, can reach out to those with little chance of being reached by other adult-education services. Apart from open broadcasting to an unorganized audience, radio listening forums or clubs exist in many countries. (The first radio school system started in 1947, and there are now about 30.) Some countries--notably Tanzania and Botswana--have used radio-study campaigns to enable a large proportion of the adult population to study a topic of national concern. The Latin American radio schools teach small groups of unschooled adults the equivalent of the primary curriculum. These strategies differ in

the kind of support given to learners: farm forums may consist simply of regular radio programs followed by discussion, while in campaigns or radio schools students learn from radio and print under the guidance of group leaders.

Television has been used in similar, but more limited ways. Viewing groups have been established in rural Sudan, for example, and in 1975 television was brought to villagers in India by SITE (the Satellite Instructional Television Experiment). In Brazil, adolescents who have dropped out from primary school and drifted to cities can complete their schooling by following a soap-opera style television series and attending weekly group meetings at a local center.

Much media-based adult education throughout the world takes the form of correspondence study, sometimes supported by broadcasts. Such programs may be for school equivalency--on a large scale as in the South Korean Air Correspondence High School or on a smaller scale as at the Lesotho Distance Teaching Center, which provides regular radio programs for adults studying by correspondence at secondary level. Much correspondence-based teacher training or professional education also provides broadcast or media support for its students. The Universidad Estatal a Distancia in Costa Rica, for example, offers a number of courses of professional training. Students at the university learn from printed booklets, correspondence, telephone, and regular face-to-face sessions, and from television programs and cassettes linked either to diagrams, graphs, and other visual material or to short lectures.

Which Media?

Only by looking at the characteristics of each medium can the particular strengths of each be defined and the suitability of each for a particular application gauged.

Radio. Radio is accessible, even to the poor and the illiterate. While radio ownership in rural areas is still spotty, a receiver is available in most communities. Moreover, since people can listen in groups, chances are that educational programs will be heard by many. Illiterate people are at no disadvantage with radio: the medium is cheap enough to use on a relatively small scale, which can extend access to those who need programs in a minority language or need information suited to local needs.

Apart from unequal distribution of receivers and poor reception in some places, the major constraints on access are those imposed by broadcasting authorities. Education broadcasts often take place at times that are inconvenient for many listeners, and it may not be possible to repeat them often enough if only a few hours are available for education. Then too, when listeners can tune in to more than one channel, rival programs may divert audiences.

Radio programs can, despite those potential disadvantages, be produced cheaply and on short notice. Consequently, producers can be flexible. Replies to listeners' questions or information about forthcoming events can be broadcast with little delay. If feedback from listeners suggests that a program is not meeting their needs, changes can rapidly be incorporated. Items of regional

interest can be included, and recordings can be made outside the studio, so that almost anyone who wishes to contribute to a program can. In countries where nearly every household has a telephone, immediate feedback is possible.

Radio is perceived as being both authoritative and friendly. Most listeners pay serious attention to what they are told on the radio. At the same time, they also appreciate the sound of a voice. It gives an impression of personal contact, which can reduce the feeling of isolation often experienced by learners in remote places. Radio can also serve as a pacemaker. A regular program can be an incentive to regular study, even though such programming may force all students to begin a course of study at the same time.

Most topics can be taught using radio alone. If the same lesson is taught by radio, television, and print, learners are likely to remember just as much from each type of presentation. Yet, for two reasons, students can learn only a little at a time from radio. First, the program itself is transitory: it cannot be reviewed like a page in a book by the pupil who wants to check on points missed or forgotten. Second, people cannot pay attention for a long time to a broadcast unless the tone of the programs varies.

For some teaching jobs, radio appears particularly effective. For example, languages can be taught on radio by native speakers, whereas most class teachers have learned the language in school themselves and are inevitably less able to teach pronunciation, intonation, and idioms.

Radio is also extremely effective where creative thinking, affective learning, or an imaginative response is required. Ideas can be stimulated or issues raised through dramatic presentations, personal accounts, or debates. (Dramatic presentations have proven particularly effective for teaching people with limited educational background.) Programs can cover social or political issues, history, literature, or even art. One radio series on painting for U.S. schoolchildren was more inspiring than a similar television series. The radio program stimulated the imagination, while the television program merely invited children to copy what they saw.

Radio is also particularly useful when the need is to present up-to-date or local information. In teaching agriculture, for example, programs can include items on new products, outbreaks of disease, or the effects of unusual weather conditions. Similarly, radio is also important when there is a need to attract a wide or scattered audience, particularly when many members of that audience cannot read. It can also provide excellent publicity for educational projects using other media, or valuable support to students, especially to those who have no teacher.

Radio can also be used in conjunction with printed materials to teach basic literacy and numeracy. As over 30 years of experience in the Latin American radio schools shows, if lessons are regular and enough time is given during the programs for students to refer to their workbooks, this approach can yield dramatic results.

Radio programs are easier, and in many cases cheaper, to distribute than programs conveyed by other media. Since long, medium, and short-wave frequencies, and VHF(FM) bands are normally available for radio broadcasting, transmitters at a single location can reach a large audience; in some cases, their signals can reach remote or isolated audiences more easily than print can. Once radio ownership is widespread, people need not congregate to listen to a radio program. Nor do they need main-line electricity: radios are now almost maintenance-free, and batteries are widely available in most countries.

Naturally, radio has its limitations. It is less effective than face-to-face teaching for communicating detail, particularly if used alone. It is also inferior for instruction in practical work that requires a pictorial or written record or demonstration as well as comprehensive instructions.

Some subjects are difficult to teach by radio, since effective learning requires numerous active responses. Here the problem is not the medium itself, but time. Where enough air-time is available, radio teaching is very effective. In the Nicaraguan primary mathematics project, for example, children respond five to six times each minute to questions asked on the radio, and these students learn math better than their conventionally taught peers do. However, using radio for such teaching when broadcast time is strictly limited is far less effective.

In considering the costs of radio, it is convenient to distinguish among the costs to the listener, to the broadcaster, and to the educator. Since few listeners buy radios to listen to educational broadcasts, for most people the cost of an educational broadcast amounts effectively to the extra use of batteries. To the broadcaster, costs can be divided between transmission costs (including loan charges, maintenance and staff costs, and electricity) and production costs (which vary according to the sophistication of the broadcast). The cost to the educator depends on the financial policy of the broadcasting station: if it is a public service station, or if it is obliged by its contract to make time freely available for education, then the educator's only costs are in staff time. But for air-time on commercial stations, which sell time, the educator will have to pay a fee.

Given these distinctions, calculating broadcasting costs entails some difficulties. One question is whether to consider broadcasting costs as a proportion of the total cost per hour of the station, as transmission costs together with production costs, or primarily as the rate at which time is sold to advertisers. A further difficulty comes in seeking a cost per listener or learner where the audience size and learning gains from radio are difficult to measure. Two general points can nevertheless be made. First, when radio and television are compared, radio is cheaper by a factor of up to ten. Second, unless the audience is very small (under a thousand, say) or located in a very small area, then the costs of distributing information by radio are likely to compare favorably with those of any form of physical distribution.

Sound Cassettes

Much of what has been said about the educational value of radio applies also to cassettes, but the differences between them are important.

Unlike radio, cassettes can be used at the listener's convenience--replayed as often as is needed, wound back to repeat a point, or temporarily stopped so the learner can make a note, repeat something aloud, or hold a discussion. The advantages gained from the regularity of broadcasts are, however, lost.

Although some cheap machines have only playback facilities, learners can also make their own recordings on most cassette machines. They can record a language drill or an answer to a question in a gap left on a cassette. They can then assess their own performance or present the recording later to a teacher. Responses or discussions can also be recorded on a blank tape for a teacher to assess. For distant learners, this exchange can constitute a form of dialogue with a teacher.

Recorded discussions can also be circulated among different study groups or submitted to a radio station for open broadcast--possibilities much welcomed by students. Even if only a few groups at any one time are supplied with cassettes, their contributions may be appreciated by a wide audience. This has been the experience of Radio Mensaje in Ecuador, a program in which recorded items submitted by village groups are compiled into educational magazine programs. These have become so popular among all listeners, even those without recording facilities, that the time allocated to the broadcasts has been doubled.

Students and teachers can listen to tapes at their convenience. The tiny "pila" project in Guatemala illustrates the advantage of this flexibility well. Recordings were prepared on topics of interest to local women--nutrition and health care, for example. Each morning, a village woman took a tape and a recorder to the local washplace, the "pila." When a number of women had gathered, she played the tape. Sometimes, the same tape was played several times, then changed when the women tired of discussing it.

The greatest difference between cassettes and radio concerns scale. Each cassette must be distributed to each listener or group, and distribution can be costly. And though the costs of recorders may be comparable to those of radio receivers, each cassette must be paid for, and few people in LDC's own cassette recorders. Further, the per learner costs of cassettes do not fall as audience size increases. It also follows that because cassettes must be recorded, copied, and distributed, new information cannot be brought to students as rapidly as with radio. All these factors suggest that, while cassettes have a place in education, they are more appropriate for small numbers of learners than for large numbers--for hundreds rather than thousands. They do have a role in training trainers and in piloting radio series. They are also valuable in conjunction with radio, since their use permits samples of learners to have their own say on broadcasts, and enables educators to provide recordings of broadcasts to small numbers of learners outside the compass of a radio signal.

Television

Television shares many features with radio. First, it can reach a very large audience, and those tuned in can benefit even if they cannot

read. Second, it can teach most subjects well, though such teaching is more effective if followed by discussion or other activities. But while television can actually replace the teacher who presents material, it cannot answer questions and respond to a class as a teacher can. Third, television, like radio, comes across as both authoritative and friendly.

The most crucial differences between these two media are not educational. The high costs of television set it apart from radio. Television programs are expensive to make and transmit, and in many countries few people have receivers. Because of high costs and other production and distribution difficulties, television must either be used on a large scale to provide much of a nation's education or else be used selectively and at great expense, where the audience or the subject matter particularly demands it.

For all that, the attractions of television are well known. Wherever television is available, people will watch it. Moving pictures present few problems of understanding, even if the commentary is in an imperfectly understood language. Thus, small children can learn well from television; and primary school children have successfully completed their schooling as a result of television teaching.

Television is particularly useful for explaining past events, exotic places, or other things that cannot otherwise be seen. It can show objects that are too small to see with the naked eye or normally hidden from view, and it can demonstrate processes that take place over a long period of time. Television makes it easy to give a rounded picture of a complete process or of an object and its relationship to others. Thus, it can be an invaluable aid to understanding and memory.

Television is also helpful for teaching practical work. A televised demonstration can be as clear as any face-to-face demonstration. A medical student can, for example, watch the hands of a surgeon more closely than he could in an operating theater. Animated film can also explain processes clearly, as has been found with mathematics teaching at the British Open University.

Television, like radio, is particularly powerful when there is need to challenge and reconsider opinions and beliefs. One television program can alert the public to an issue it ignored when reported in the press--as happened in Britain with reports about starvation in Kampuchea. On the other hand, though, television pictures can be so powerful that they distract viewers from the main point of a program; viewers can end up discussing a quite different issue from the one the program was meant to highlight.

Used on a large scale, television can bring about major changes in education. In numerous countries, it has been used to teach children in schools all their lessons. Generally, the children have used workbooks that match the television lessons and have been guided in their studies by teachers or monitors. In some cases--in Niger and El Salvador, for example--television lessons have introduced a completely new curriculum. But if such large-scale schemes are to succeed, they need the support of teachers, administrators, and children. Yet, while most children appear to like televised lessons, many

teachers do not. Even in cases where care has been taken to train teachers in their new role as guides, problems (such as a teachers' strike in the early years of the El Salvador scheme) have arisen. In other cases, such as American Samoa, continued teacher resistance has contributed to the reduction of a once-enormous educational television scheme into optional programs for class enrichment. But, at the same time, if such schemes work well, they can catalyze change, simultaneously introducing better teaching and a better curriculum, and training the teachers.

The drawbacks of television, against which its strengths must be measured, include its transience (to compensate for which, another recording medium must be used), and its limitations in introducing many points that must be remembered and in inducing active responses by learners. Theoretically, pauses can be left for responses; in practice, where there are heavy demands on television time, this is seldom possible. In the case of literacy teaching, which demands such time, television may well be more expensive than class teaching. (In this regard, television's main value may in fact be in broadcasting publicity for a literacy project rather than in teaching people to read.)

Finally, television is not yet in practice open to as much participation by students as is radio. Field recordings require expensively equipped mobile units or portable video equipment whose use still presents problems, particularly in LDCs.

To reiterate, though, television's main drawback is expense. (For the receiver, television sets may cost 20 times as much as radios.) Television demands more expensive equipment, better engineered studios, and, generally, more expensive transmitters. Beyond that, the signals require greater bandwidth. Television signals, transmitted at VHF or UHF, reach smaller audiences than radio, so more transmitters are needed. Production costs are necessarily higher--particularly if educational programs are to match the sophistication of entertainment programs, most of which are imported from metropolitan and technically advanced countries.

Two consequences flow from television's high cost. First, in poor countries, primarily the elite own television sets, and reaching a large out-of-school audience is difficult unless community viewing arrangements can be made (which also depend on power supply). Second, establishing an educational television service where no ordinary television service exists means that the entire costs of setting up transmitters and studios fall on the education service. (Conversely, using spare capacity in a television service established for more general use costs far less.) As a result, projects that have set up a separate television service for education, as in American Samoa, are likely to have higher costs per student than those, like the Mexican Telesecundaria, that use excess capacity in an existing television system. In the former case, costs are likely to be higher than the cost of orthodox teaching. In the latter, they may be lower. More generally, the costs of broadcast television rule out its use for small audiences.

Closed-Circuit Television and Video Cassettes

For small-scale use, closed-circuit television is an alternative to open-transmission television. Programs can be shown exactly when they are required and recorded for use as often as required. The audience is controlled, so teaching can be tightly geared to specific needs. (In addition, two-way communication using a telephone link can be introduced.) Closed-circuit television requires production and reception equipment similar to that which television requires, but it can rely on cable or simple microwave links instead of transmitters and sophisticated linking networks. In practice, closed-circuit television installations vary in scale, complexity, and cost. Some systems cover all the schools in a large town; others consist of little more than one camera and one monitor used simply to display material more conveniently.

Recently, portable videotape recorders have become available so that a recorded television program can be physically taken to an audience as an alternative to broadcasting or establishing a regular closed-circuit link. The development of videocassettes also makes it easier to transport and use recordings.

Portable video equipment has also been used in a rather different way for community education. Since the camera is easy to operate and since tape can be played back immediately, people can make a tape and view and discuss it on the spot. Such discussions may have two results. First, they may enhance understanding of community problems and decisions. Second, viewers can decide how the tape should be edited, so that their message may be conveyed clearly to those in positions of power. As projects such as the Skyriver Project in Canada have demonstrated, video can be an effective medium for defining issues and initiating change. Through discussion and editing, people can also educate others about their needs.

Inevitably, people have to travel to see video recordings unless the tapes are used for an open-circuit broadcast. Programs made with portable video equipment will therefore generally be watched in groups, and the equipment must be taken to them. Playback machines are expensive and delicate, and they cannot be used without a power supply. The tapes themselves are still expensive, though reusable, and they are awkward to distribute in any quantity. Recording facilities present similar problems. The equipment is expensive, so mobile video should be introduced with caution in countries with poor roads and poor service facilities.

Closed-circuit television programs or programs made on portable video equipment could be expected to be cheaper than open-broadcast programs since they do not demand transmitters, and makeshift studios may be acceptable. But the cost per audience member may well be higher--with the possible exception of metropolitan closed-circuit classroom television services--since the audience size is much smaller. Where recordings are regularly reused as a substitute for ordinary teaching, closed-circuit television may prove cheaper than orthodox teaching. But few projects have, in fact, demonstrated such savings. Portable video equipment has for the most part been used experimentally with small audiences and for a small number of hours per week. Cost per audience member, if it includes staff costs, is thus necessarily high even though the equipment is relatively cheap.

Satellites

Communication satellites offer an alternative to terrestrial links for distributing radio or television signals. They may be of potential importance for LDCs, but for many purposes satellites must for now be regarded simply as an alternative way of carrying signals.

Film

Film can have the educational impact of television, but film involves the learners in a quite different way. First, people must make the effort to go to a film. Besides that, films are shown on a large screen, and the picture and sound are generally clear enough for those sitting some way away to see and hear well, so large numbers can easily be accommodated. Because the audience is gathered together, the opportunities for discussion or other follow-up activities are immense. In addition, if a film commentary is in a language that most of the audience does not understand, someone can translate it into the local language as it is shown. Unlike television broadcasts, films can be shown as often as needed. (On the other hand, the production and editing process takes time, so film lacks the immediacy of television.)

Unless they are televised, films must be taken to their audiences. They are, however, easy to transport. They have to be distributed in mobile film units with generators if no main-line power supply or projection equipment is available.

Hollywood boomed because films, though costly to make, are cheap to reproduce and cheaper still to show. The economics remain the same today. While it is possible to make relatively cheap films, it normally costs more to make and process film than videotape. In a country that lacks a commercial film industry, getting film processed locally may be impossible, so extra delays and costs can be expected. Once films have been made, however, the costs of showing them are relatively small since projectors have become reliable and widely available. If a film meets the interests of many audiences over many years, then the cost per viewer may drop until it compares favorably with those of other media.

Still Pictures

Still pictures may take the form of slides, filmstrips, flipcharts, charts, photographs, or drawings printed in any form of booklet. They are instrumental to good teaching because of their value in illustrating concepts or adding life to a description, stimulating questions or exercises, serving as a reminder of a point just taught, and providing variety. But still pictures have a limited effect if used on their own. Even if they are clearly sequenced, pictures generally need to be explained and related to each other by a teacher using an accompanying text or a tape or radio program. Yet, coordinated sound and pictures are effective for teaching languages, and also for explaining difficult topics clearly, perhaps because the student must concentrate at a controlled speed.

Pictures can be printed on paper, in books, or on charts, flipcharts, and posters. The learner needs no special equipment to view such pictures, though illustrations must be pre-tested where cultural differences may affect understanding. In general, all types of illustration--line drawings, photographs, or photographs with blanked-out backgrounds, for example--teach equally well. But for any one purpose, a particular type may be preferable. Line drawings, for example, may illustrate stages in a process better than photographs can.

The cost of reproducing illustrations varies greatly. Reproducing line drawings under most conditions costs no more than reproducing texts does. To reproduce black and white photographs demands more expensive printing equipment, while the reproduction of colored photographs is more expensive still. In many markets, the cost of paper for reproducing even black and white photographs is higher than the cost of that used for print and line drawings alone. Flipcharts or posters are likely to be more expensive to produce--and to distribute--than material in smaller sizes, partly because larger printing equipment is needed to reproduce them. Since they are often distributed to classes or groups rather than to individuals, however, the additional costs may be acceptable.

Slides provide high-quality reproductions of pictures in black and white or in color. They are generally arranged in sets and accompanied by teaching notes or an explanation tape. These sets can easily be modified to suit regional needs or updated. Moreover, they can be used by individuals, in which case a cheap hand viewer is adequate, if a viewer is needed at all. If they are used in a group, a projector and main-line electricity is needed. Slides are costly to reproduce and their production entails no economies of scale. In addition, few LDCs have many copy facilities.

Filmstrips can be more convenient than slides: pictures are fixed in order so it is difficult to go wrong showing them. On the other hand, a strip cannot be modified as easily as a set of slides can. As for equipment and costs, powered projectors or cheap hand-viewers are required for viewing. Strips are cheaper to produce than sets of slides, but even fewer copying facilities of the type needed are in operation in LDCs, and the strips are more easily damaged.

When Are Media Useful?

It goes against common sense and experience to dictate the use of a given medium or combination of media for a particular educational task under stated conditions. Such decisions are based on too many variables: costs, the number of students, subjects, media, variations among students in educational background and personality, the need to present any one subject in many ways, and wide variations by country in the availability of equipment, trained manpower, and labor costs. Beyond that, this complexity means that there is often more than one good choice. Yet, some general conclusions do hold true.

First, the costs of using audiovisual media to improve schools are normally additional to the costs of the schools. They can, however, be justified since the use of the media can reduce dropout rates or raise pass rates, and thus reduce the cost per successful student.

Broadcasts have been used successfully for teaching any or all the standard school subjects. Here, however, the relation between teachers and media is crucial. If media do no more than provide classroom enrichment, they tend to earn support from teachers but to have little measurable effect on education other than to increase costs. In contrast, if media are used for direct teaching, then teachers may oppose their use. In any case, teachers or monitors need to be trained in the use of media. Similarly, the relations between teachers and producers are crucial. If each group holds to different opinions of how best to teach and neither will meet the other half way, a project will fail.

Second, the success with which audiovisual media have been used to enable schools to be opened where none were before or to teach children without access to a proper school depends on three conditions. One is the existence of a broadcasting network so that the costs of creating one do not fall on the educators alone. Another is the wider use of monitors rather than teachers. (Even though monitors are usually paid less than teachers, they have no preconceptions about what is expected of them and can accept their role as guides, while teachers must unlearn one behavior and learn another.) Still another is the confinement of the use of audiovisuals to secondary schools, where they are more cost-effective at the primary level.

Third, the use of audiovisual media is particularly desirable when they make it possible either to attract a large audience or to reach a small but scattered audience that has highly specific needs. Audiovisual media can be used to give organized support to agricultural extension, health education, and other educational services, so that the combined effects of face-to-face contact and teaching through media increase agricultural productivity, decrease mortality or morbidity, or achieve other desired results. Where improvements occur on a large-enough scale, the use of media may be cost-effective compared with face-to-face extension work.

Future Developments

The future of audiovisual media depends both on the economic structures of the countries using them and on future technological developments. Whatever those turn out to be, three developments already in force may affect the use of the media significantly.

First, improved videotape recorders are being developed. When cheap, reliable, and hardy videotape recorders are available, videotape will be used more widely and casually than it is now. Then, the relative costs and convenience of using film and videotape are likely to change.

Second, with videocassettes, it is relatively easy to exchange and play back television recordings, whether recorded from an open-circuit or closed-circuit system. Then too, videodisc equipment, working on quite different principles, may also soon be available. Most likely, robust equipment for playing back mass-produced recordings, but not for making recordings, will soon be available for less than the present generation of videocassette equipment costs.

As broadcasting satellites with more power are developed, it will be possible to broadcast directly to individual homes with rooftop aerials for radio or television. (For television, the speed of this development will also depend on the pace of rural electrification for receivers.) Educators will then be faced with questions of scale: broadcasting satellites will be most economical when they are broadcasting to a very large area. But wide-area broadcasts have their drawbacks too. In any large area, cultural and linguistic differences between learners can be so great that educational needs at basic levels cannot be met by one set of programs. At post-primary levels, where curricula are likely to be more similar, the number of students is so low that the cost per student of satellite communication may remain too high.

CHAPTER II

NATIONAWIDE NETWORKING OR LOCAL BROADCASTING?

II-1. THE HISTORY OF NATION-BUILDING AND THE FUTURE OF LOCAL BROADCASTING*

It is a stubborn fact that most Less Developed Countries (LDCs) were not constructed from the popular will; they were not created through the spontaneous gathering of constituents. Many stretches of the borders of these countries were drawn after World Wars I and II, as the result of compromises among the big powers. To LDC peoples, these boundaries imposed by outside forces can seem artificial, even irrelevant. Here is a conspicuous example: nomadic tribes, bound by blood rather than by land ownership, can have little natural sympathy toward the idea of a nation, which is essentially a geographic institution. Indeed, the original concept of a "nation" flies in the face of nomadic life. If a modern state is to be formed despite such obstacles, people need to have a clear consciousness about their territory (where they form communities), and, later, about the nature of a nation.

The modern nation developed only gradually through the enlargement of the community. It has resulted, variously, from struggles among feudal clans, the confrontation of religious sects, timely industrial production (particularly of war technology), increases in agricultural productivity, and the capitalistic vitalization of the economy. But, more fundamentally, it remains an assemblage of local communities.

Historically, the concept of a nation is never a priori. Many related conditions account for the shape it eventually takes.

Geographical Conditions

Productive land is one of the prerequisites for transforming the land into a modern nation. Dimensions are less relevant than the capacity to utilize available resources: depending upon their natural inheritance, small nations can prosper and large nations can remain impoverished. The shape of nations can be determined by rivers, oceans, mountains, deserts, and forests. But these natural boundaries seldom completely block the flow of people, culture, and artifacts from outside.

Most modern nations were founded in the peripheral regions of ancient empires. England, France, Germany, and other Western European countries sprang up in the outland regions of Rome's hold. Near the frontier of the Chinese Empire, Korea, and across a strait, Japan grew into nations. Other nations were carved out in relatively unpopulated territory by waves of emigrants, as the United States and Canada were.

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* This section of Chapter II was written by Shigenari Futagami.

Impact of Religion

Within the geographical framework, groups of communities gradually become a structured unit capable of the production, distribution, and consumption of goods. An important structural element in this transformation is religion. With the birth of great religions, clearly different from primitive myths, came established universal principles that reached directly to the heart of all community members, thus weakening their limited blood ties--in pre-religious times, the most dependable link among groups of primitive people, and a governing relation that mythology sought to justify. But organized religion dominated by universal rules gradually gave rise to individualism and widened the bonded community. This individualism prepared the way for a more productive society.

Communal Cooperation

Another important factor in building a productive economic unit is the motivation for each villager to acquire a surplus product, to save that surplus, and to put it to practical use. It is difficult for an isolated village to create such a surplus. Only through economic circulation among many communities situated on a larger unit of land can a surplus develop and, in turn, foster economic development. Take the example of irrigation. Irrigation technology at the farm level has been refined over a span of more than a thousand years in some Asian and European countries. Starting an irrigation system has in every instance required entrepreneurship, technology, at least some political maneuvering, and, above all, community cooperation. The operation and maintenance of irrigation systems also both call forth and strengthen managerial and technical capabilities in each village and among the cooperating villages.

To take another example, farmers motivated to increase crop yields in Western Europe introduced efficient plowing, improved animal-husbandry techniques, and developed three- or four-course (rotation) systems. These improvements quite often necessitated cooperation and agreement among farmers in adjacent villages. Here too, the technological incentive requires alliances that it also promotes.

Political Framework

The strength and vitality of a modern polity depend largely on the evolution of leadership in the pre-modern society. Leadership for productive activities has come from those who were the descendants of ancient despotic families, from ex-governors of local regions in these empires, from military organizers, and from strong tribal chiefs. Before the formation of the state, the fittest of these had dominated several regions, each of which was wide enough to yield surplus products for supporting the leader's military force. The regional leader allocated sections of his land to his principal subordinates, committing them to improve the agricultural productivity enough to strengthen their share of the armed forces. In peace time, each of the military lords worked hard to make the most of his resources--farmers, water, and livestock. In war time, he frequently served as a cavalry officer for the regional leader.

In Europe and Far East Asia, the chief of a region could establish a relatively autonomous local economy. As the primitive fortresses were one by one replaced by castles, in which the chiefs lived, the regional lords came to reign over the region's economy, as well as to serve as the heads of the army. The behavioral codes of Chivalry and Bushido (the Samurai's code), reinforced by Christianity, Buddhism, and Confucianism, were established as the spiritual backbone of these local societies. With these self-contained regions in perpetual competition with each other, such refined doctrines both set forth the rules of warfare and increased the efficiency of local government management. (In short, they contained the beginnings of both foreign and domestic policy.)

Several strife-ridden centuries had to pass before any group of competitive local governments could form a modern nation to protect their lands and economy from outside threats. During this period, loose control by central rulers over local chiefs created the basis for modern government: these rulers introduced the notion of paying daily allegiance to a local authority and higher allegiance to a centralized one on a seasonal (taxes) or occasional (war) basis. This crucial period, the feudal age, is characterized by the strengthening through doctrinal religion of the individual's consciousness of his contribution to his own community and by the foundation and development of a regional economy. While it cannot be demonstrated that the feudal period is an indispensable prerequisite to modernizing an economic system, building up regional economies is indisputably the foundation of modern statehood.

Consciousness of Progress

As the size of production units grew and farm technology improved, agricultural productivity increased, and the increased surplus thus produced was reinvested in the further improvement of production. Impressed by these visible improvements, people became conscious of "progress." At the grassroots level, the perception of historical progress (even of historical change) is quite new: early medieval villagers had no such consciousness. Yet, grassroots people's recognition of social progress is the key to social dynamism. By providing villagers with a strong incentive to save for more productive investment in the future, it helps assemble first the resources of a village and then the resources of a group of villages--a congregation of capital and skills that is the basis of industrialization.

Initiative in establishing a local economy was frequently undertaken by entrepreneurial feudal lords and leading farmers. Saving and investment were often involuntary, coming as they did through taxation and compulsory labor. Thus, in the feudal age the prosperity of a regional economy frequently hinged on the capability of a leader. Competition among lords stimulated the local economy to become more efficient. But the rulers' interventions did not keep farmers from innovating or from finding other ways to increase the surplus within the mini-economy. Indeed, to maximize local economic potentials, capable rulers found themselves concerned less with imposing duties than with organizing farmers' incentives.

Military Needs

No matter how preoccupied with the agricultural economy, every lord had to maintain and strengthen his armed forces. The improvement of weapons--first the bow and arrow, then firearms--inevitably undermined the cavalry's dominance, and as infantry became the nucleus of a bigger army, which only a large-scale economy could support, many feudal clans found themselves without enough capital to support an infantry division. To meet this huge and ever-escalating demand for capital, clan lords turned to urban traders, who were beginning to accumulate surplus wealth.

Commercial Cities

In the first commercial cities, prosperous merchants began to organize quasi-democratic governing bodies. But these independent city governments could not develop into modern states because commercial cities did not contribute much to the development of the neighboring local economy. Port cities on the major European rivers, the North Sea, the Mediteranean Sea, or the Japan Inland Sea, for example, became centers of international trade but were not directly involved in the productive economy of their local hinterland. Their prosperity did not lead to nationhood because they did not have sound local economies as foundations.

The commercial prosperity enjoyed in these European and Japanese cities resembles the temporary prosperity Iberian ports and Arabic commercial centers experienced in medieval times. Because these latter urban economies had no direct ties with agricultural development in their hinterland, the financial resources accumulated through plunderous trade did not recirculate in and thus fortify either the local or national economies. Conquistadores and adventurous merchants contributed to the wealth of imperialistic monarchies, but these monarchies did not invest that wealth in local agriculture, which ultimately would have provided a more stable income and more solid foundation for nationhood. Thus, while mercantilism eventually led to European economic expansion, mercantilism itself could not be the prototype of capitalistic development.

The lesson of the feudal age? The mere existence of surplus money does not trigger local economic development. Where the profits of international trade are not plowed back into local agriculture--as they were not in the Iberian Peninsula and in South and Central America--the development of the modern polity is perforce retarded. But when the grassroots of one locality is motivated by a common cause, even the lack of capital cannot for long block the inhabitants' initiative to increase both agricultural and industrial productivity, which are the prerequisites of modern nationhood.

Local Development and the Notion of Nation

A nation cannot be legislated into existence or imposed on people. In a number of languages, "country" means land, a region, one's native district, or a rural district. Only gradually has it come to embrace the notion of an economic or political framework. Now, "country" means a nation or a state as well.

Historically, the prototype of a pre-modern country is a productive (in most cases, agricultural) unit of land big enough to support a ruler's headquarters in his castle and the military defense of those headquarters. As long as the people living on the land have enough stability and incentive to continue to live there and improve their lives, industrialization has a firm base on which to build. In turn, this basis makes effective local and, eventually, national government administration possible.

The LCD's Local Economies

This history lesson speaks directly to present-day LDC government officials. If they want to improve governmental management, first they must recognize that in many cases even local governments have only begun to take root. How can they expect to govern effectively a nation composed of pre-feudal entities? Actually, many development projects in LDCs suffer from this very lack of depth of local government.

LDCs are now facing the problems of attending an exodus of youth from the countryside to a few bulging cities. If the LDC governments try to cope with existing urban poverty without examining its roots, their efforts at stemming this flood will be no more successful than "downstream" measures ever are. A more effective "upstream" solution to the rural exodus is to face squarely the weakness of local communities. Strengthening the local economy is the prerequisite of the sound development of any nation.

Most LDCs took modernization to mean the introduction of advanced technology and modern institutions of the Western European style. Once they opt for this variety of modernization, they cannot come back halfway without causing waste and chaos. Thus, in most cases, they should hold to the course. But this should never mean abandoning all traditional values. The challenge is to fit old values to new institutions. This is a difficult task, one that may require decades, but accomplishing it is of utmost importance during this crucial period of the transfer of both technology and institutions. It should be clearly recognized that imported technologies and institutions are the products of civilizations that developed over centuries and that modern nations themselves are unique historic products. At the same time, we know that an historical pattern does exist: the strength of strong and long-lived nations stems from the strength of their local communities.

Mass Media's Roles in Local Development

The importance of cultivating the consciousness of grassroots people and motivating them to build up viable local economies cannot be overestimated. Nor can the decisive role communication media can play in this process. Yet, few LDCs have adequate, efficient mass-communications facilities. Some newspapers are published in LDC capitals, but many such papers are in a dominant international language and are circulated mainly among elites. In some cases, they may even broaden the gap between the elites and grassroots by helping the ruling class strengthen its advantage. Only a few LDCs have a local press, and in those countries, the choice of publication language is a cruical problem, as is how to use the selected languages to better purpose. But even

these questions are moot beside the basic constraint of poverty: at the current cost, there is little demand for print media.

Radio is obviously a more feasible way for linking local communities and for unifying education and training efforts in a region. Radio can constantly stimulate and raise people's consciousness, and that consciousness on the part of community members is the key to economic development. Radio can appeal to both literate and illiterate people. Today, radio receivers are inexpensive and sturdy. Even a poor family in an LDC can buy a radio and afford to replace the batteries periodically. Also, program production and transmission equipment has become less expensive, more sturdy, and easy for even small communities to install. Perhaps the most important asset of radio is that a local LDC community can run its own radio station for its own audience. If needed, a local radio station can be easily integrated with a national network program. In any event, radio in LDCs can play a key role in solidifying people's consciousness of their contribution to their own community and country, which is the basis of a modern nation.

II-2. NETWORKING AND LOCAL BROADCASTING: A CHOICE?*

The two basic approaches to using radio and television to achieve educational and development goals are nationwide or network broadcasting and local broadcasting. Networking, broadly defined, refers to the simultaneous airing or delayed broadcast of the same programs over several stations in different places at any given time. Local broadcasting, on the other hand, refers to that strategy wherein radio or television programs are produced either at the central network station or at the local level and then relayed to other stations for non-simultaneous broadcast as needed.

Networking Versus Local Broadcasting

Any assessment of the relative strengths and weaknesses of networking and local broadcasting in light of development objectives and in the context of Less Development Countries (LDCs) should be based upon five main factors.

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* This section was written by Gloria Feleciano.

One major factor to consider is financial. In both local and network broadcasting, finances influence control and management. They are also one means of evaluating the system, either on its own merits or in comparison with other media. "Low costs" refer primarily to low monetary outlays by the system's managers to set up and maintain broadcasting services. In national networking, initial investments are greater because larger sums are required for setting up hardware facilities for both the central and the transmitting/relay stations. Local broadcast stations, on the other hand, require a lower initial investment because less expensive and less sophisticated technical facilities are needed.

In terms of production budgets, local programs tend to be less expensive to produce because the creative and the technical staff charge relatively lower fees. Conversely, central network stations usually require higher production budgets since skilled people command higher wages in the larger commercial areas where most such stations are located. However, in the long run, national networks cost less to run than local broadcast facilities do because they serve larger audiences.

A second factor to consider is training. Most LDCs lack trained engineers, creative writers, and skilled managers--all of whom are essential to any broadcasting venture. Local broadcast stations require the same types of personnel as central network stations do, but trained technical and creative staff are even harder to find in rural and semi-rural areas than in cities, so the quality of local programming tends to suffer. True, central network stations have more sophisticated equipment to operate, which requires a higher level of technical know-how. Yet, only a small number of people need to be trained or retrained to use that equipment.

A third factor is advertising support, on which privately owned local and network stations largely depend. In the Philippines, for instance, under the system of "private ownership," broadcasting is necessarily a business undertaking. In this context, stations must depend on the sale of time to advertisers for their revenues. However, since broadcast time has no commercial value if the station has no listeners or viewers, the station has to carry programs that will attract an audience. In the Philippines, radio and television stations base their price rates for the commercial minutes they sell on four factors, namely: (1) area, (2) kilowatt power, (3) time slot, and (4) program ratings.

Thus, theoretically, nationwide network stations earn greater profits than local stations by selling advertising spots at higher rates. However, advertisers may be willing to buy spots only if the commercial messages reach the advertisers' distribution areas via relay stations.

The fourth consideration is audience coverage. Of course, national network programs reach wider audiences than do local programs. Central facilities can simultaneously disseminate development-oriented programs on a wider scale, within less time, and at less cost than can local stations. Yet local broadcasting, with its relatively smaller audience, can make program content more relevant to the needs and interests of its audience. (It can thus be argued that local broadcasting fosters regionalism while network broadcasting fosters nationalism.)

The fifth factor is technical quality. The reception and transmission of local broadcasting programs tend to be of better quality because transmitter stations are relatively close to the receivers. While national networks are individually more powerful than local stations, few are powerful enough to blanket the whole country with signals that are neither weak nor disturbed. However, with the advent of the domestic satellite, better transmission on a nationwide networking scale may be attained.

These five considerations are interdependent and interrelated. Operating procedures and finances determine both the number of transmitters available for national networking and the number of local stations that can be built. For advertising, the lifeblood of a commercial station and one source of revenue for quasi-governmental stations, rates naturally vary with the station's effectiveness as a publicity medium, the size of the potential audience (which, in turn, depends on the strength of reception and transmission), and the size of the actual audience (which depends largely on the relevance of program content to the potential audience). Relevance and quality of program content are, in turn, dependent also on the talent and technical expertise a network or local station has at its disposal. Similarly, creative and technical expertise cannot flourish without the appropriate financial and operational support.

National Networking in Relation to Local Broadcasting

The foregoing discussion of the characteristics and relative advantages of national networking and local broadcasting suggests that neither networking nor local broadcasting can stand alone. Indeed, network and local broadcasting are mutually supportive. In the ideal system, national networking is supported and sustained by the local systems and vice versa. Thus, wide-area transmission from a central point, which is characteristic of national broadcasting systems, requires complementary back-up by local systems that can take account of the differing needs, interests, climates, languages, and cultures of the immediate audience. Side by side, the two systems can also take into account regional and subregional variances in norms and values. This mutually supportive system of national and local broadcasting is actually common in developed countries. But in LDCs, broadcasting systems tend to be of one type or the other.

In countries where national networking is regarded as a public service, authorities seek to enable everyone to listen to national programs. Accordingly, they tend to establish a close network of coverage throughout their territories, even if some of the stations become "uneconomical" by commercial standards. A variant on that approach, the practice in the Philippines, has been to install a relatively small number of powerful stations to carry transmission to all areas. In addition, relay stations of low power are used to provide reception for remote communities where ordinary transmissions cannot be picked up.

In contrast, LDCs with predominantly privately owned local and network stations suffer from the opposite problem--lack of adequate coverage. Commercial stations in such countries tend to compete for listeners in the larger population centers at the expense of more sparsely populated areas.

Although in private broadcasting, variety is generally guaranteed by competition between stations, program content is often dictated by the principle of "highest mass appeal," which may translate into an extremely low level of intellectual fare. Indeed, the desire for popularity is seldom compatible with that to improve public tastes and artistic standards.

In the Philippines, competition has forced networks to produce fewer cultural and educational programs and more shows with higher mass-entertainment value. Many deplore the Philippine's present system of commercialized programming because it relinquishes too much of the control of broadcast management to the advertiser. The advertiser invests in broadcast time to build favorable public opinion for his product, as well as to sell it. The prerequisite of such popularity lies in providing program fare that most members of the audience like. Thus, in the Philippines today, more broadcast stations are affiliated with commercial broadcast networks than with independent stations. Most broadcast stations are owned by big commercial enterprises. In fact, of the nation's 270 radio stations, 231 are commercial. A relatively small number of stations are owned by the government and educational organizations or religious groups. Most local stations are run as commercial stations financed by advertising and sponsorship, and they function as virtual extensions of the music and electronic industries.

If, in contrast to the Philippines model, national government-owned stations were to be developed as alternative systems--answering the audience's developmental, educational, and informational needs--while privately owned local stations offered entertainment and commercial programs, then these two systems could check and balance each other. In such a hybrid broadcasting system, initiatives for further developing and strengthening the local broadcasting system quite often come from the national system, which can help the local one both to improve technical equipment and to develop the human resources needed for programming. Then too, the national system can help expand advertising revenues on the local level to a point where they can support and sustain local station productions.

The strengths of a hybrid system are mainly technological. In a joint national-local system, a community can improve its broadcasting system through the local manufacture of small-scale parts. But just as important are the incentives granted at the national level, the price breaks made possible by the pooled importation of hardware, and the nontaxation of domestically manufactured hardware. These and related measures encourage the further technological advancement that a communication system aimed at education and development needs.

With the benefits of a hybrid broadcasting system plain to see, further exploration and experimentation is needed in LDC settings on the expansion of existing local broadcasting systems. In particular, these studies should focus more attention on the cost and benefits of national versus local broadcasting. Such studies and experiments need the support of governments and international agencies and should be conducted at all levels--regional, national, and global.

Existing data are too sparse and inconclusive to permit the trustworthy assessment of the relative merits of national networking and local broadcasting in relation to the spread of knowledge, the development of attitudes conducive to nation-building and national unity, and the introduction of practices that will help realize national development goals. But even without the data we need to make full assessments, the need for balance in broadcasting is clear. If national networking and local broadcasting can co-exist, not as competitive or contradictory channels of information and education, but as partners in the effort to merge colors and cultures into a united community, then LDCs can begin to become part of the "global village." They can then become deeply and positively involved in each other's destinies.

II-3. LOCAL BROADCASTING AND COMMUNITY MEDIA*

Most recent discussions of the media have contrasted their macro forms--the "big" mass media--with the more local "little" media. It is an important distinction, one that highlights a recurring problem. Mass media have inherent advantages: a considerable audience, economies of scale in manufacturing, and the capability of plugging into existing distribution infrastructures. But at the same time, they lack the intimacy, local relevance, and two-way flow of the smaller forms.

The transition, historically, was first from micro to macro: the media began without broad infrastructures and were built up to larger proportions. But the smaller media persisted, or were reintroduced as alternatives to express and support community forces. The two are now coming together, viewed not so much as alternatives, but as mutually reinforcing elements in a total communication system; and this movement, prompted initially by political and social forces, is being assisted and sustained by modern technology.

From Local Broadcasting to Rural Development

Local broadcasting is nothing new. Indeed, the origins of radio were at the local level in both North America and Europe. As national networks gradually emerged, regional stations, or regional "opt-outs" from national services, were retained to provide audiences with local news, cater to minority language and cultural groups, and offer a limited showcase of community talents.

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* This section was written by Alan Hancock.

However, the concept of locality and community has changed in the past two decades. In Less Developed Countries (LDCs), these notions were influenced initially by discussions of rural growth and development. This debate, crystallized by Philip Coombs' book Attacking Rural Poverty helped to bring into focus the relevance of rural communications--a focus that was sharpened as social and cultural indicators became more widely accepted, along with purely economic factors, as guides to development. Indeed, LDC communities are characterized by isolation from ideas and information as well as from services, and communication media can be the cheapest and swiftest means of reaching rural audiences with advice and expertise where none has existed before.

The early emphasis was in principle on the use of mass communications: messages flowing from capital cities to the periphery. In most cases, feedback from the communities was limited. Telling and teaching, rather than the exchange of requests and ideas between the center and outlying areas, were the norms.

However, since the late 1960s and the 1970s, a new spirit has prevailed. At all levels, in both LDCs and industrialized countries the emphasis has switched to using media to provide social and educational opportunities for adults and drop-outs, particularly in informal environments. In industrialized societies, this was first reflected in home-study programs, the development of community resource centers, and the creation of public media channels. In the LDCs, it appeared in the design of new media systems, and in the emphasis accorded to development communication (that is, media used in association with social and economic development). Everywhere, rising costs and retrenchment made for a new interest in lower-cost technologies and the "rediscovery" of radio. Radio's suitability in the field of nonformal education, where institutionalized reception points are few, and where the costs of providing receivers have to be met by individual listeners, is easily demonstrable. Moreover, radio is less expensive than television by a factor of at least three.

The Forum Model

Some of the earliest attempts to localize the use of radio were through the use of listening groups, particularly those associated with agricultural and literacy programs. The idea of the farm forum originated in Canada, but was swiftly adapted to the Indian Continent, beginning with a limited and carefully evaluated experiment in Poona, and subsequently applied (although with less overall success) throughout India. The listening group model was applied in Tanzania and Ghana in the mid-1960s, and it was extended to cover television in Senegal in the late 1960s and early 1970s. In Jamaica, in the early 1970s, the JAMAL program for national literacy development was reorganized to make systematic use of radio, audio-cassettes, and other media.

The principle of community participation was first practiced in many of these experiments. The programs were in many cases recorded on location, and dialogue between producers and audiences, and between different local audiences, was a linchpin of the experiment.

The Radio Schools

In Latin America, a similar model was used in the various radio schools. Here, as in other places where American models of broadcasting predominate, local or regional broadcasting is a common feature. (In Europe, in sharp contrast, national networking came relatively early, leaving local forms to re-emerge in the 1970s.)

The original inspiration for the movement was Accion Cultural Popular (ACPO) in Colombia. (ACPO was based on Radio Sutatenza, which was founded in 1947 by a Catholic priest.) But many of the derivative models in the 1960s and the 1970s differed materially from the original. In Colombia, Radio Sutatenza had begun by concentrating on technical and educational skills; in Brazil, the MEB movement (Movimento de Educacao de Base) set out with the deliberate objective of "conscientization," social animation. In Mexico, the Radio Primaria project tried to extend educational opportunites by bringing through the radio medium fourth-, fifth- and sixth-grade classes to children in rural communities (although by doing so it probably contributed inadvertently to the problem of urban drift). In Ecuador, the Tabacunda project used open broadcast radio channels to reach farmers, linking its programs with a tape-distribution system. Radio Santa Maria in the Dominican Republic began a radio-assisted literacy program in 1964, but extended this in 1970 to embrace more formal academic equivalency programs. In Honduras, the Coordination Council for Development (CONCORDE) combined basic adult education and radio broadcasts with leadership training and community organization. Again in Mexico, in 1971, the Campo y Productividad project used both radio and television to illustrate farming techniques and to train farmers in the process of decision-making.

All these projects, first implicitly and later explicitly, served two objectives. The first was relatively traditional: to use the broadcasting media to reach rural audiences and help equip them with basic educational and technical skills. A second, more oblique objective was to help these audiences undertake basic decision-making at the community level. The movement toward local and community forms of media has been a gradual and evolutionary process; no sharp line demarcates educational and outreach projects from communication programs that focus mainly on community involvement. However, hindsight does reveal a new trend, foreshadowed but not articulated by the earlier experiments, that goes well beyond the confines of education.

Access and Participation

Educators now see education less as a distinct sector than as a part of the overall development process, whether this be social or individual. The change of perspective is shared by communicators: indeed, it has probably helped more than any other factor to bring together the educators and information specialists who for so many years saw themselves at best as separate, at worst as in conflict.

The new perspective is based upon the concept of "democratization." The position of the modern communicator is summed up well by the International Commission for the Study of Communication Problems, which was set up by

Unesco and presided over by Sean McBride. The final recommendations the Commission made in its report in 1980 include the following passage:

> Implementation of national policies should be carried out through three complementary communication patterns: first, from decision-makers towards different social sectors to transmit information about what they regard as necessary changes in development actions, alternative strategies and the varying consequences of the different alternatives; second, among and between diverse social sectors in a horizontal information network to express and exchange views on their different demands, aspirations, objective needs and subjective motivations; third, between decision-makers and all social groups through permanent participatory mechanisms for two-way information flows to elaborate development goals and priorities and make decisions on utilization of resources. Each one of these patterns requires the design of specific information programs, using different communication means.

Community Media in the Industrialized World

The origins of community media were political. They reflected a growing concern with the concepts of access and participation, which pervaded philosophical thought in the 1960s and 1970s. They are perhaps best expressed in the model of "conscientization" of the people, articulated by Paolo Freire in Pedagogy of the Oppressed. But although this model had its origins in Latin America, in North America and Europe the same principles took the form of "alternative" approaches to the mass media, approaches designed to maximize the media's democratizing influence and to provide a platform for minority opinion and dissent.

Community media can be local or national, and they include both radio and television. National systems have moved well beyond the simple "phone-in" program to experiments such as that in Denmark, where the national radio organization set up a "Radio Workshop" with its own production and editing facilities, designed to accord the public access to both technical facilities and air time on the second network. In Holland, a regular week-end program features live discussions in which members of the broadcasting audience interview politicians, public figures, and decision-makers. In the U.K., the BBC offers to minority groups air time on television and the assistance of technical staff and producers who, without acting as editors or censors, help the group realize its objectives. Another television series in Finland presents the opinion of minority groups in the form of a debate in the presence of the host community.

This trend toward broadening access has gone farthest in the community-level proliferation of video groups, most of which use the media to express political or social convictions. Sometimes these groups replay their programs through a local cable network. Sometimes they use them as resource material in public meetings or community events, or as the core activity of a local library.

Some of the experiences of the industrialized West also laid the foundations for educational media use in LDCs. The Canadian program, husbanded by the Extension Department of the Memorial University, undertook what is probably its best known work off the coast of Newfoundland, in Fogo Island. The main thrust was to use the media to reflect communities to themselves, as a kind of public introspection out of which new insights and community-building forces might emerge. In the course of this work, far more became known of the role of the group "animator," who acts as a neutral observer and stimulus rather than as an active participant. The first phase of the Fogo project was conducted on film. But by 1971, the economic advantage of videotape production and its instant-replay function gave video the edge, and film was thereafter reserved exclusively for items that were to be preserved as records or shown to wider audiences. The techniques that evolved in this long experience have since been disseminated, not only throughout North America, but also in Africa, Latin America, and the Caribbean.

The Problem of Development

The problems involved in this transfer of communications technologies and communications techniques proved considerable because conditions in the industrialized countries differ so fundamentally from those in LDCs. In most Western industrialized countries, community development projects focus on community groups that are "out of step" with the rate or level of development that the majority have achieved. But in most LDCs, deprivation is on a much larger scale. Often, it is rooted in traditions that have yet to be challenged. Yet, redistributing the benefits of development is likely to reduce the economic and social position of those currently in power while increasing that of the disadvantaged majority. To quote the McBride Commission again:

> Communication should be considered as a major development resource, a vehicle to ensure real political participation in decision-making, a central information base for defining policy options, and an instrument for creating awareness of national priorities.

Many of the early attempts to adapt community media to LDC settings were tentative and short-lived. But by 1977, the need to consider local media forms within the development process had reached sufficient proportions for Unesco to call a meeting of experts in Belgrade to review the problem. Its purpose was summarized by Juan Diaz Bordenave in his monograph "Communication for Rural Development." At issue, says Bordenave, were

> the close relationship that must exist between messages and community decision-making, thus engaging communication's involvement in such activities as: (a) encouraging diagnosis by the community of its own situation and problem; (b) providing access to all relevant information on alternatives; (c) organizing the people; (d) aiding the community to obtain means and resources--that is, power; (e) creating suitable institutions for community decision-making and collective action.

Community Media in the Developing World

The developing world drew on Western models of communication tools. Indeed, many LDC communications experiments were devised, financed, and organized through technical cooperation schemes, either within the United Nations system or through bilateral channels.

Local Radio. Local radio experiments were assisted by the growth of FM radio, for which relatively inexpensive and reliable equipment was becoming available. (A transmitter with a ten-year life, with adequate coverage for a local community at a strength of 1 to 3 kilowatts, costs roughly US$200,000, and costs fall as demand increases.) While in the past, radio programs aimed at minority people were possible only in industrialized countries, this potential has now spread to LDCs: in the Philippines, for example, one local radio station is run and financed by a worker's combine. Other communication tools--portable video, audio cassettes, and the local press--are designed to interact with local audiences more directly.

Video. One early use of the video form was in Tanzania. In 1971-72, the Tanzanian Year 16 project was carried out in three villages by a six-member video team seeking to record the historical experience of the Ujamma Movement. This record was to come, not from the Government, the organizers, or officials, but from the people themselves. Video was to be used as a means of self-expression, making people more critically aware of their situation and promoting dialogue between the people and their distant leaders. The project produced in its life some two hundred hours of video material, and the team spent lengthy periods of time with the villagers, promoting discussion through weekly video showings. Although the project was not without its problems (including threats aimed at officials who came under criticism in the tapes), Tanzania is still eager to continue using the general approach.

Many other experiments using video media, some of them short-lived, are on record. Among them are those in India, Pakistan, Sri Lanka, Guatemala, Gambia, and the Philippines. A good example comes from Peru, where the Audio Visual Production Center for Training (CEPAC) is the communication arm of the national agricultural training and research center. Financed by the United Nations Development Program and executed through the United Nations Food and Agriculture Organization, this project uses portable video to make training programs that are taken to the rural farmers. (Support comes from a team of thirty agricultural extension agents.) Because of its "snowball" methods of training and production, it has considerable outreach: some 40,000 campesinos in 1979. Not political in thrust, CEPAC emphasizes participative learning rather than social animation, and it employs a team of all-round media generalists who eschew notions of professionalism.

Audio-Cassettes. Approaches using audio-cassette technology are also focussed on rural environments. A characteristic example comes from Guatemala, where cassette recordings on health and nutrition subjects have been used to improve health care among coffee plantation workers. These materials are produced on location, in much the same way as radio programs: realistic material is used to assure a local flavor, and the didactic components of the tapes are built around this documentary material. Training is given on the

use of recorders and on battery changing, and the materials can obviously be employed as part of an extension or outreach program.

The same kind of approach has been used in the context of agriculture in Afghanistan, and most recently in Ecuador. It is also the focal point of the Audio Cassette Listening project, which took place in Tanzania in 1977-78. The Tanzanian project was designed for rural women, and it drew directly on the experience of the earlier radio campaigns on health and nutrition. The carefully designed project incorporated formative evaluation, but the choice of topics was left largely to the village women. Working with the help of women's groups, the project workers emphasized the training of group leaders and animators. Following the philosophy of Paolo Freire, they stressed means, especially dialogue, that help participants focus on their own needs. It was a careful exercise in strategic planning (in such areas as needs assessment and evaluation) combined with flexible discussion and group animation. The tapes and other materials produced for the project included both didactic and problem-posing elements, with the two carefully counterpoised to reinforce each other.

Television. Another example of the use of media in a development-sensitive manner is the local television station in Kheda, India. This station, organized and programmed by the Space Applications Center in Ahmedabad, was originally an offshoot of the SITE experiment, set up as a laboratory for program development. But it continued operating after the NASA satellite had been withdrawn and still broadcasts for an hour each day, serviced partly by the national network, partly by the Space Applications Center. Programming has been aimed primarily at the underprivileged groups in the community (specifically the Harijan, the landless laborers), but the programs are received on community sets in the villages and watched by a mixed population. They focus on community mobilization and the development of self-reliance, but they do so in concrete ways, dealing with everyday subjects.

Production in this project is carried out by teams, each of which includes a researcher, a producer, a scriptwriter, and a content expert. Broadcasts contain a considerable proportion of on-location material (shot on portable video), and formative evaluation is stressed in program design. It was originally anticipated that once the SITE experiment had finished, interest in the programs would wane, but this has not proved to be the case: for the one hour of daily transmission, in any one day about 60 percent of the sets are switched on, so the programs reach some 12,000 people.

Rural Press. Community media have not been limited to the electronic media. Especially in Africa, they also include the rural press.

Rural newspapers in Africa are recent and innovative. A few years ago, the expression "rural press" was simply a neologism. The earliest newspapers began in Liberia in 1963 and in Niger in 1964 in the form of mimeographed bulletins distributed in conjunction with literacy campaigns.

In 1971, a survey of eleven African countries (including Mali, Togo, Zaire, Benin, Gabon, Upper Volta, and Senegal) indicated the practicality of establishing a rural press where printing facilities and basic journalism skills were available and where there was an ongoing literacy or rural

development program. Basic needs were outlined: the identification of rural journalists and communicators; the identification of a language spoken, understood, and used extensively by most of the proposed audience; the availability of a printing press; raw materials; an infrastructure conducive to the regular publication and distribution of the newspapers; and the existence of a rural development agency or office.

Mali was the first country to set up a rural newspaper. Kibaru was launched in the Bambara language in March of 1972 under the direction of the Mali National Agency of Information and of the daily newspaper, l'Essor. Its initial circulation increased rapidly from 5,000 to 10,000 copies.

Mali's venture in rural journalism encouraged other African countries to follow suit. In September of 1972, Game Su was published in Togo under the joint sponsorship of the Ministry of Social Affairs and the Ministry of Information, with the assistance of Unesco. The latter half of 1972 was to see the birth of yet another rural newspaper, Sengo, published in Zaire.

Most of the early newspapers were linked to literacy programs. This connection not only determined the content, style, and reading level of the newspapers, but also greatly influenced the choice of language that was used in teaching literacy. In those cases in which a single language (such as Swahili, Ewe, or Mawse) was universally spoken by the villagers, there was little problem. But where a different language is spoken in every village along the main road, the choice of language becomes an important policy decision. Should the newspaper choose a highly local language to reach the people more effectively? Or should reliance be on a more widely used language in the hope of reaching more people and eventually creating a more widely used information vehicle? (See Chapter V.)

Beyond Community Media--Bridging the Gap

Community media, in both the industrialized and the developing worlds, are not the sole focus of the debate on participation in communication. Much attention has been focussed in recent years on widening the base of access to media. As a result, the original distinction between macro and micro forms is gradually becoming blurred. Some forms of communication technology that seemed, at the time of their introduction, exclusively fit for use in the industrialized world have now been adapted to suit smaller audiences and LDC communities. The first of these is the satellite. The satellite programs of PEACESAT (which uses a satellite for audio connections between remote Pacific territories to link university campuses), the experiments in two-way radio communication for medical purposes in Alaska, the various experiments surrounding the NASA satellite ATS-6 (especially that in India), the emergence of low-cost and mobile satellite ground stations--all of these have eroded the early image of the satellite as the tool of rich countries only.

This adaptation of high technologies for LDC use may help to resolve one of the dilemmas of community media development. The projects described earlier concentrate on extending opportunites for development by importing ideas and expertise to local communities. This is true not only of the highly localized audio-cassette and video projects, but also of the radio school

approach and the television teleclubs, all of which require people to be organized around the media. Many such externally generated projects prove short-lived: problems that have bedevilled community media workers are where to go after mobilization and how to sustain enthusiasm once the tangible objectives of community media initiatives have been achieved.

One approach to the problems lies in the creation of opportunities for the community itself to move out into the broader world. Improved telecommunications may provide part of the answer, and in some countries steps are now being taken to strengthen telecommunication systems. In Alaska, a network of 120 satellite ground stations now provide "open channel" communications to every permanent community of twenty-five or more. In India, plans are to install public telephones in villages of over 2,500 people and in district and subdistrict headquarters, especially in poverty-stricken areas. Kenya and Tanzania plan to extend postal and telephone services to all villages, and several Latin American countries (including Colombia, Ecuador, and Costa Rica) have development plans that call for installating public telephones in rural areas and for adding more exchange systems. The relationship between group media (that is, media designed to assure communication within or between groups and communities) and broader transmission systems, especially the telephone and radio, is the key to successful participatory communication. At the simplest level, a community group that has defined its goals can use the telephone to make contact with decision-makers. Linking group media activities with local radio can provide a platform for wider discussion and can stimulate even those people who have not been touched directly by group media projects to participate in ongoing activities. Programming from local radio and television can be introduced into regional broadcasting channels when programming issues have grown beyond strictly local interest, and such feedback from region-wide communication is more likely than that from narrower communication channels to make an impact on authority.

The Contribution of Technology--Moves Toward Self-Reliance

Perhaps of equal significance to the question of the community's integration into the larger world is that of the impact of technological developments that have led to the miniaturization of such communication equipment as cameras and video recorders. The emergence of digital technologies and the growing number of applications of the silicone chip have helped reduce the size of production systems, make distribution systems more sophisticated, and increase storage and access capacity. While these developments are as yet only partially applicable in LDCs, they hold great promise for the future. Once the investment price of educational media has fallen, LDCs are in a better position than their industrialized counterparts to create new communication systems, because LDCs have less investment and interest in older forms and infrastructures.

The process of adaptation has, in any case, begun. A recent Unesco program has brought together a consortium of LDC engineers to design a genuinely low-cost camera and recorder system. In India, the Space Applications Center has a flourishing program in communication technology adaptation: it is looking for cheaper, simpler, and, above all, indigenous ways of producing communication tools. In Indonesia, the electronic blackboard (a

device that allows for the transmission of simple visual information via telephone or radio links) was first developed.

The earliest move in the direction of self-reliance was toward appropriate educational media technologies--an approach that initially meant encouraging the development of simple and low-cost communication technologies. But this has since been extended to embrace a decision-making and needs-assessment strategy that relates communication media to specific educational and social objectives. Community media need not be (and in LDCs cannot afford to be) simply alternative or underground communication channels. Instead, they have to find a place in an overall communication system, within which mass and local media each have a part to play.

CHAPTER III

Can Mass Media Be Effective in Curriculum Improvement?*

The mass media can contribute to curriculum improvement from the standpoint of both the child and the teacher. To children, the mass media can provide equal opportunities. If every child in a country has a radio or can read, each stands to gain an equal amount of information through the mass media. Furthermore, the mass media can present new information more attractively than a classroom teacher can be counted upon to do. When, for example, the need is to report upon natural, social, or cultural developments in remote places, or to express concretely an abstract concept, mass media can usually illustrate such information better than teachers can. This is particularly true with respect to timely information: print media and audio-visual media may provide such information more skillfully and rapidly than a classroom teacher can, while radio and TV can relay it more quickly still.

The third contribution of the mass media to the child's development is their help in teaching the child survival skills--the ability both to learn from and to criticize the commercial advertisements, violence, sex, and other elements of the programming presented by the media.

In the case of direct teaching by mass media, the media themselves are both curriculum and teacher. Strictly speaking, mass media production teams consisting of teachers and media specialists can teach directly through radio and TV, arranging goals, content, and material sequences. Therefore, curriculum improvement is also media improvement, particularly in selected fields or in Less Developed Countries (LDCs), where the pool of skilled teachers is small. Indeed, in the Dominican Republic, students in the "radiophonic school" earned higher achievement scores than those in conventional schools. In Japan, works by pupils who learned calligraphy from a professional calligrapher through closed-circuit TV were evaluated as superior to those by students of an experienced teacher who was not a professional calligrapher. Overall, where good teachers are few, radio and TV teachers can teach more effectively than classroom teachers. Similarly, where classroom teachers can scarcely be expected to undertake curriculum improvement, and where national goals or the standard curriculum are clearly set, curriculum improvement through mass media is highly effective.

For teachers, the mass media can be used to supplement classroom presentations. Of particular importance here is the media's use in presenting new knowledge or information on new technology: if either is beyond the facility of the teacher (or the students) to present, the mass media can fill in the gap. They can also show teachers ways to design, use, and order the sequence of instructional materials since the programs themselves serve as models. At the same time, of course, the mass media can show better and more innovative ways of teaching.

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* This chapter was written by Takashi Sakamoto.

When teachers themselves must develop, implement, and improve curriculum, the assistance of mass media is invaluable, if not indispensable. In LDCs, as well as in industrialized countries, information from the mass media--print and audio-visual materials, radio, and TV--is the key to improving curriculum content, lesson plans, and instructional methods. Mass media can also take the place of a teacher.

To put media's educational uses into fuller perspective, it is necessary to consider the three important communication functions teachers fulfill. First, they present information corresponding to the educational profiles, goals, and competence of the learner (age, sex, personality, previous experiences, readiness, etc.). Second, they observe, receive, acknowledge, and diagnose the learner's responses and the learner's progress, and then evaluate them in relation to the educational goals. Finally, they present cognitive and affective feedback to learners. By giving learners the right answers, a judgment on the learners' responses (correct or incorrect), and a summary of what learners do or say, teachers help learners determine exactly what they should do. By showing their acceptance and appraisal of or sympathy for the learner--be it by saying "Well, very good!," "Wonderful!," or just smiling at pupils--teachers help learners acquire emotional stability in the learning situation, which increases their motivation for learning. In all three of these activities, the medium functions as a mediator, expanding a teacher's capacity to present material compellingly. For example, TV can show what a teacher wants to emphasize more clearly than a gesture or the voice can. Printed matter (books, magazines, journals, pamphlets, etc.), devices (maps, charts, models, puppets and experimental tools, and equipment), information software (slides, filmstrips, films, concept films, tapes, magnetic sheets, discs, videotapes, and videodiscs), and equipment (radio and TV)--all these media can usually extend teachers' presentational functions. As tools of observation and evaluation, devices such as cameras and video tape recorders also enhance the teacher's powers of observation. By the same token, information-processing equipment such as data analyzers and computers can partially expand the teacher's evaluative function.

To sum up, mass media--printed materials, slides, films, radio, and TV--are widely used to expand mainly the first communication activity, that of presenting information, while teachers in most cases undertake the second and third communication activities unaided. Tutors in the Open University in the United Kingdom, field teachers in the Dominican Republic's "radiophonic school," and classroom teachers using radio and TV in many countries serve these functions. The important point is that classroom teachers can choose to use the mass media for a variety of purposes. Therefore, maximizing the positive impact of substituting mass media for teachers requires not only improving the mass media themselves but also improving mass media <u>use</u>.

Besides substituting for teachers, the mass media can be used to extend the teaching function. This can be done either through curriculum design by course-production teams or local teachers) or through one of four types of media-assisted direct instruction.

In Type I, both curriculum designing and teaching functions can be totally replaced by some form of mass media. Films, reference books, radio, and TV can be used in independent study without a teacher's guidance. In

such situations, the mass media have a direct teaching function, and learners throughout a country or region can be taught simultaneously. A centralized model of utilizing mass media, Type I use (particularly where experienced teachers are few) must surely be the most important and widely applicable.

In Type II, centrally produced programs can partially replace the teacher's teaching function. The course team provides the subject matter, and learning takes place with the assistance of a tutor or classroom teacher. For example, a radio or TV teacher provides the main content of instruction to learners all over the country or region. Then, the local teachers in the classrooms or study centers help learners study what has been presented. Exemplified by the Open University in the U. K., this approach too is useful where there are not enough experienced teachers.

In Type III, teachers selectively combine and use multi-media materials. Teachers design their own curriculum, select suitable items from ready-made mass media materials, combine them, sequence them, and incorporate them into their teaching without themselves participating in the production of the media segments. This approach can involve the use of books, guidebooks, programmed books, audiovisual materials, teaching machines, taped radio programs, and videotaped TV programs.

In Type IV, the classroom teachers design their own curriculum and use mass media as teaching aids. When they want to expose students to the customs of a remote area, for instance, they can select and show films or TV programs on social events to learners within the framework of their own curriculum. Here, the main teaching function rests with the classroom teachers, who use handouts, textbooks, tapes, radio and TV programs, and videotapes. (In rare cases, in well-equipped countries, teachers can produce their own programs by editing video-taped programs.)

Which means of improving curriculum is best depends upon which of these four ways the media are being used. In Type I, the curriculum is improved mainly by improving the mass media. The improvements are made by authors of printed materials, by radio and TV teachers involved in educational broadcasting programs, or by the course teams that create multi-media instructional materials. In Type II, tutor or field-teacher retraining is also required. Tutoring and guidance at the local level is enhanced at the same time that guidebooks, newsletters, or radio and TV programs are upgraded. In both Types I and II, curriculum improvement is undertaken exclusively by specialized curriculum-development teams at the central or national level.

In Type III, curriculum improvement is conducted in two ways. Either the mass media are improved exclusively by the central production team, which then sees that the improved materials are delivered to local centers and schools, or teachers receive in-service training so they are better able to improve the curriculum themselves. In in-service training, the focus is on instructional design, media design, media production, and media administration, and some aspects of the training itself are through the mass media. (Other aspects are organized locally. The local teacher-training staffs instruct local teachers with the support of related information provided by the mass media.) In Type IV, curriculum improvement is also assisted by the mass media.

The mass media can provide local teachers with high-quality material they can use to improve local curricula. They can also expose local teachers to better teaching techniques, as well as to better methodologies of curriculum improvement. For instance, printed materials can describe the basics of better teaching and curriculum improvement, while audiovisual materials can demonstrate model teaching methods and model processes of instructional design. In addition, local teacher-training staffs can use such audio-visual information when they conduct in-service teacher training for improving curriculum.

In general, where local teacher trainers, qualified local teachers, and instructional materials at local centers and schools are in short supply, or where the national educational goals and standard curriculum are clearly set by the national or regional center, the Type I or Type II approach to curriculum design and media use proves most effective and economical. Indeed, the first type is widely seen throughout the world in such varied applications as Sesame Street-type programs, SITE (Satellite Instructional TV Experiment) in India, and educational radio and TV programs for adults. Unfortunately, the full potential of the media to respond to and evaluate learners is seldom exploited in these applications. For this reason, a combination of printed materials, radio or TV, and tutors or field teachers appears more effective.

Regardless of which of these ways the mass media are used, a variety of resources should be kept on hand at the national educational media center, local centers, or in each school. In the centralized model, various information conveyed through the mass media must reach each child, so several well-equipped centers are needed from which to transmit that information. (Broadcasting is most efficient, though other sorts of mass media products and programs can also be useful, if they are stored in local centers and distributed to each school on schedule.) In the decentralized model, a variety of mass-media productions should be utilized at each school. If they are to correspond immediately and appropriately to different teacher demands, then tapes, videotapes, concept films, maps, charts, journals, newspapers, pamphlets, lesson plans, examination items, programs, and coursewares should be stored at school resource centers or at other local institutions or depots. When the decentralized model of mass media use is adopted for individualized instruction, then relatively large numbers of local centers and schools must be well-equipped with large amounts of such material. Of course, setting up such centers requires considerable capital, qualified teachers, teacher-training staffs, and instructional resource personnel. Where these resources are not available, the wiser choice is to establish a network of the air, using radio and TV, and thus to maximize the use of a limited number of qualified teachers, teacher-training staff, and resource personnel. Here, the need is to make sure information on the content and schedules of broadcasts is delivered to tutors, field teachers, and learners.

The final word should be devoted to the potential of the mass media to improve the curriculum by improving the teachers' competence. Newsletters, newspapers, journals, radio, and TV can supplement textbooks and guidebooks by providing a continuous flow of new and useful information to the teacher. For example, when set theory is introduced in school mathematics or the science curriculum is changed, local teachers previously unexposed to the new ideas cannot be expected to modify the curriculum themselves. They need examples of

lesson plans based on the improved curriculum and a description of the improvement from the curriculum committee. Only mass media (in particular, a combination of printed materials and radio or TV) can quickly provide this sort of information simultaneously throughout the country. At the same time, the mass media provide model teaching methods, models for sequencing subject matter, and model lesson plans; through radio and films, teachers can find models and inspiration for improving their teaching techniques.

Curriculum--from a course of study to the design of teaching or learning processes--is usually set by a representative group selected at the national level or by the community on the basis of national goals and cultural and social mores. Other determinants are the sequence demanded by the material, the competence of the teachers, the characteristics of the children, and both the quality and quantity of materials. While this multiplicity of considerations makes curriculum design a delicate and difficult matter, some formulas for improving lesson plans and classroom teaching have been developed.

Media-based Teacher Training for Curriculum Improvement

The Radio-Television University for Teachers, created in 1974 in Poland with the objectives of upgrading the skills of over 400,000 teachers, utilized print media, radio, TV, broadcast notes, seminars, meetings, and examinations. In this certification program, radio was used to comment on problems brought up during the courses. TV was used to present up-to-date scientific and technical information and practical examples of educational theories, to stimulate teachers to seek life-long education, and to make them receptive to innovation. TV also helped motivate teachers to expand their knowledge through self-learning. Overall, the program appealed to the imagination of the teachers, invited reflection, and stimulated self-learning.

In Algeria, a teacher-training project based on radio and TV has in just six years helped over 200,000 newly employed teachers improve their skills and, in many cases, ascend the educational hierarchy.

In France, radio and TV are being used in teacher training to explain new teaching content, to introduce teaching innovations, and to help teachers who teach many different subjects overcome the difficulties associated with such a regimen.

In the Ivory Coast, a TV project for teacher education started in 1972 showed that the use of TV helped standardize and modernize training methods.

In in-service teacher training in Kenya, radio has also been used along with print media, short courses during holidays, and examinations.

These are but some examples of the successful use of mass media in teacher training. To understand why these projects have succeeded, as well as why others have failed, it is necessary to see the improvement of teaching performance with respect to three different levels of learning--behavioral, observational, and conceptual.

Teachers can improve their techniques (or teaching behavior) through actual teaching or through simulation games in a hypothetical teaching situation (including role playing in micro-teaching and teaching simulation games). Observational learning occurs when student-teachers are presented with examples of model teaching or with visual feedback on their performance in teaching-simulation games or actual teaching. Finally, conceptual learning occurs when teachers have the characteristics, strengths, and weak points of their styles explained to them. In discussions after simulated teaching trials or actual teaching demonstrations, student teachers and participants describe verbally which performances were good and which could be improved.

In teacher training, an approach that addresses all levels of learning is most likely to help teachers improve their performance. Ideally, student teachers get the chance to observe other teachers' and their own techniques live or on VTR, to verbalize the characteristics of each participant's teaching performance, and to repeat teaching trials until improvements are ingrained.

Of particular interest and use in such teacher-training efforts is microteaching. Whether part of pre- or in-service teacher training, this approach usually involves one of the teachers in a teacher's role and the others in children's roles in a simulated classroom. These simulated classes are videotaped or tape-recorded for the purposes of analysis and discussion. Participants talk about how teaching performances could be improved, reconsider both the lesson plan and teaching, then undergo another teaching trial--in most cases finding their teaching performance greatly improved. In such exercises, all three levels of learning are integrated: the behavioral level as the teaching trial, the observational level as model teaching observation and video feedback of the participants' own performances (video self-confrontation), and the conceptual level as the discussion and evaluation of weaknesses.

Another training exercise that addresses all three learning levels is the desk-top teaching simulation game, the main objective of which is to identify in a simulated teaching/learning situation possible problems with the lesson plan and the teaching performance. Here too, one of the teachers or student teachers takes the part of the teacher, and the others play the roles of students. On a large paper board on a wide desk, they place paper puppets representing the teacher, children, radio, and TV. Each child puppet is identified by a name and salient characteristics (for example, John--mild, Mary--violent). Those who play the students are expected to behave badly, and any player who anticipates or experiences problems can ask to halt the game at any time to discuss how the teaching performance and lesson plan could be improved. These processes are videotaped and played back.

Recommendations

Clearly, the mass media can be useful in curricula improvement if they are used carefully and sensitively and if the requisite material resources are available. Their effectiveness, however, also depends upon the clarity of the educational objectives they serve.

The following educational objectives, adapted from Malaysia ETV, suggest the potential of mass media generally in educational innovation. They may merely provoke thought, or they may serve as models.

1. Strengthen the nation by reducing imbalances and improving educational opportunities in rural schools handicapped by a lack of qualified staff and equipment.

2. Improve the quality of education through the use of sound teaching methods and supplementary audio-visual materials.

3. Assist in curriculum reforms through speedy and effective delivery.

4. Improve attendance rates at all levels by motivating pupils by means of interesting program materials, audio-visual techniques, and increased personal attention in large classes.

5. Assist in teaching subjects where trained schoolteachers are in short supply.

6. Promote civic consciousness and national unity through civic programs at both primary and secondary levels through the phased introduction and use of the indigenous or national language.

7. Disseminate information of interest to parents, and keep teachers up to date on curricular innovations and practices.

8. Assist in teacher-training programs, both pre-service and in-service, through employment of new media techniques.

Besides well-formed objectives, any efforts to improve curriculum through the use of the mass media should also be underpinned by other, more practical guidelines. First, it may be worthwhile to set up a central committee to improve the standard curriculum in each field of intellectual, moral, and physical education. Experienced people from every field could participate, helping the committee improve standard or widely used curricula. Second, every effort must be made to include the newest, most effective, and most comprehensive content in the revised or reformed curriculum and to present it interestingly and efficiently using the best talents and communication technologies available. Third, in educational broadcasting for pre-school and primary-level schoolchildren, careful attention should be paid to restrict the presence of violence, sex, and commercial advertising. Fourth, if the improved curriculum is to be widely communicated and utilized, it may be necessary to devise a mass-media package: some of its elements would convey the main points while others would communicate subsidiary information and advice on use of the package. Last, the committee in charge of improving the curriculum should work closely with the standing curriculum development committee, if one exists.

Another group of considerations surrounding the improvement of curriculum using the mass media concerns developing a system for delivering subsidiary information through guidebooks, newsletters, newspapers, or broadcasting. (A new educational technology of interest here is the teletext and viewdata system used in the U.K.: through it, the audience can get information transmitted by TV broadcasting, telephone, or TV monitor using a special keyboard.) Regardless of which medium is used, a pre-established schedule should be followed precisely. Another important tool is a teacher's center for information exchange. At such a center, teachers' experiences could be presented and model teaching using the mass media could be exhibited, resources permitting. Finally, it is useful to explain to parents the effects of the mass media: this step helps educators realize the mass media's full potential, and it counters negative media influences. To promote the positive use of media and to help to overcome some of the more negative aspects (e.g., those of advertising), educators must, through teacher-parent discussions or some other means, help parents become informed and involved in the development program.

A last group of recommendations concerns teacher training. Teachers should be trained both in mass media use and in curriculum improvement. Where a teacher functions as a mediator for the mass media (i.e., where mass media teach children directly), the teacher should be trained to gain access to such media and to provide for their more effective use by children. In addition, where a classroom teacher functions as a tutor (assisting the radio or TV teacher), the classroom teacher should be trained to elaborate and extend the content, to assess children's understanding, and to suggest further study materials for the children. Moreover, where teachers behave as employers or managers of mass media (using mass media as a tool for teaching), they must be trained to integrate mass media into the curriculum, to select and edit media programs, and also to develop curriculum through a systematic cycle of design, implementation, and evaluation.

At the same time, three other steps should be taken. First, effective methods for curriculum improvement through the use of mass media must be investigated. Second, standard curriculum for curriculum improvement should be developed, particularly at the university. Third, teachers should be trained to treat the mass media as influential resources inside and outside of school, cooperating with parents and the community to promote optimal mass media use and cultivating the ability to analyze and criticize lesson content.

Improvement in the use of mass media will depend on the economic, social, and educational conditions of a country, but the effectiveness of educational media policies will depend upon how well they are considered, planned, and implemented.

CHAPTER IV

HOW CAN RADIO BE USEFULLY APPLIED TO EDUCATION AND DEVELOPMENT?*

To decide whether and how to use radio for education in Less Developed Countries (LDCs), decision-makers must consider the evidence on radio's effectiveness and then look at how radio can be linked with other media, particularly with print. These imperatives call for an examination of practical experience using radio for development and education, of the general role of broadcasting in development, and then of broadcasting's place in education both in and out of school. Last, they lead to consideration of various styles and formats of programs of radio and of other broadcasting media.

Can Radio Teach?

Radio's place in education depends on two of radio's features. Radio communicates through only one of our senses and its signals are broadcast--in the literal as well as specialized sense of the word. Since we can tell nothing about the expression or attitude of the radio speaker, we might expect to lose something vital in a communication process based on hearing only. Yet, when radio was being developed for use in education in the 1920s and 1930s, the comparative effects of teaching by radio and in the ordinary classroom were studied extensively, and most such research found no significant differences in the results of the two methods. Similar results were found in Trenaman's research on adult learning. In short, Trenaman found, "the physiological means of perception is itself only of small importance in the communication of ideas; what counts is the situation in which communication occurs--the reading and listening habits of the respondent and the character of the subject matter in question." Given an environment conducive to learning, ample evidence shows, people can learn from radio. Moreover, little evidence suggests that they will learn less effectvely, or more, from radio than from other media. Indeed, according to communication theory, if conflicting signals are sent simultaneously through different channels, the signals are likely to interfere with each other and learning suffers, so perhaps radio's power to concentrate attention compensates for its being limited to one channel of communication.

In practice, it is radio's capacity to distribute information that has led to its use for education. From the 1920s it has been used to inform and to motivate a large public audience. And for almost as long, it has been used for the smaller, more specific, school audience. Mary Sommerville, who started BBC schools broadcasting in Britain,

> "saw the new medium ... placing at the disposal of the teacher an instrument that would neither do his work for him nor even share with him the burden of his straighforward curricular teaching. Its task would rather

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* This chapter was written by Hilary Perraton.

> be that of bringing to every child in every classroom a kind and quality of experience that would otherwise be unattainable. The task of the school broadcasting service that she created was to enlist the inspired speaker who could share with children an enthusiasm or an idea, the traveller with a tale to tell, the journalist in touch with the news of the day; the skilled and imaginative scriptwriter, and the first-class professional performance of music and drama. (J. Scupham, Broadcasting and the Community).

Radio was first used in education to bring new resources into the classroom. It was soon also used to take the classroom to students outside the school's walls; in Australia and New Zealand, it was used to reach remote and isolated students who could not get to school. And in both Britain and North America, radio was used in the 1930s to teach listening groups of adults, a practice taken up and used with greater effect in the 1940s in the Canadian farm forums. More recently, radio has been used to carry the main burden of teaching basics to students who would otherwise have no formal education at all.

Thus, radio has been used to distribute public information, to enrich ordinary classroom teaching, and to extend education beyond the classroom walls. The experience of all this work confirms the theoretical and experimental studies that show that radio can teach.

A Multi-Media Approach

Radio teaches best when it is linked with other media. (See Chapter One.) Hence, its role is best considered in conjunction with that of other media. While it can be analyzed from a variety of perspectives, five categories seem to cover most applications.

> Broadcasting for development. Many broadcasting stations, especially those run as government or public service stations, have seen radio's central functions as broadcasting about development and molding public opinion about development. But broadcasters and politicians alike regard them as important, they take up many hours of broadcasting time, and they cannot be excluded from a discussion of broadcasting and education.

The other four categories all concern what has often been defined more narrowly as educational broadcasting. Each represents a type of support that broadcasting provides, rather than a different sector of education. Here, the types are considered in order of the complexity, simplest first.

> Open broadcasting. Open educational broadcasts are those in which no attempt is made to teach the radio audience except through the broadcasts themselves. The function of an open broadcasting authority is simply to produce and transmit programs, not to control the conditions under which they are used, or to supply supporting material, or to organize learning groups.

Broadcasting with print support. Somewhat more complicated than open broadcasts are broadcasts linked with print so that listeners, teachers, or group leaders can have a permanent reference document on the same subject as the broadcasts. Many school broadcasts, for example, are supported by teachers' notes.

Broadcasts with print and feedback. The step beyond print-supported broadcasting is broadcasting enhanced by regular and systematic feedback from listeners, often through their enrollment in correspondence courses linked with broadcasts.

Broadcasts for groups. Finally, educational broadcasts with print support and learner-feedback mechanisms have been used to teach groups of adults. Under this arrangement, the groups provide feedback while the broadcasting authority or an associated institution helps establish and support the learning groups.

The appropriateness of each of these broadcasting modes varies with the educational sector. Thus, each must be examined in relation to schools, to vocational education out of school, to programs for equivalency (in which adults or children outside school work for the same qualifications as are available within), and to rural education (generally on agriculture, health, and rural development).

Broadcasting for Development

Much open broadcasting, whether labelled educational or not, is directed toward national development goals. In countries as different as Brazil, Nigeria, and Tanzania, for example, it is seen as contributing to national unity. Its purposes have been defined more clearly in Tanzania than in most LDCs.

> The duty of the service is to help and sometimes even to bring about a direct ideological and attitudinal revolution among the millions of Tanzanians, many of whom have no other means to get to know about the goals and priorities of our Party and Government. This duty applies both to the national and to the commercial channel: The principal aim of our Commercial Service will be to establish a basis of bringing about a revolutionary attitude so that they appreciate and buy more of what are our own products so that the nation as a whole moves towards the central economic aim of self-reliance. (Elihu Katz and George Wedell, Broadcasting in the Third World)

To many LDCs, radio's appeal stems from the fact that development and modernization are associated with the spread of techniques of mass communication, even though a causal connection between the two is difficult to establish. Elihu Katz and George Wedell have suggested that broadcasting "has thus been one of a collection of transferred attitudes and institutions that in the countries of the West have been the effects of development, but that in the developing world have been regarded as among its causes." As a result, the hopes for broadcasting may have been higher in the LDCs than in the industrialized world.

These high hopes notwithstanding, the effects of broadcasting have been examined more critically in the last few years. While, in theory, a radio station can reflect the views and beliefs of a government bent on furthering development and fostering a sense of national identity, in fact there is a legitimate fear that "the media are capable of sowing the seeds of cultural homogeneity and thus, ultimately, of dependence on the West and its trinkets." Within Latin America, for example, mass media's goals have been described by Luis Beltran as being markedly at odds with national development. Summarizing the characteristics Beltran has identified, Richmond Postgate cites:

> (a) the stimulation of irrational buying behavior; (b) the promotion of values which, in general, are alien to the local cultures and sometimes noxious to them; and (c) the impairment of the audience's ability to appraise critically their society and culture, and thus, seek to transform them.

The danger that broadcasting--be it for entertainment, for news, or even for education--will be dominated by materials generated in rich western countries was recognized by the McBride Commission. It recommended that priority should be given by LDCs to extending their radio networks and to producing radio broadcasts locally. Imported programs do not, however, represent the only danger. Programs adapted from or modelled on those that succeed elsewhere may retain the style and values of the original even if the content is local and familiar. The many adaptations of the children's television series, Sesame Street, for example, have been criticized for indoctrinating children in LDCs with the values of western consumer societies.

While a full analysis of the role of general broadcasting in education and development is out of place here, it is important to set in context any discussion of educational broadcasts. Since most educational broadcasts last fewer hours and have smaller audiences than other broadcasts do, it is particularly important to keep in mind the (albeit scantily researched) effect of the many hours of other open broadcasting on learners and would-be learners.

Open Broadcasting

Open educational broadcasting is important, even if its audiences are relatively small. Broadcasters, educators, and agriculturalists all testify to its importance by devoting many hours to it, year after year. But, partly because it is hard to get feedback from thousands of isolated listeners and expensive to get it from hundreds of schools, little is known about the effectiveness of open broadcasts, either for schools or for adults.

It does nonetheless seem clear that, in rich and poor countries alike, primary schools are keener to use broadcasts than secondary schools are. In secondary schools, scheduling problems related to the need for teachers to specialize in a single subject limit the use of radio broadcasts.

Radio programs are probably of most value in teaching subjects about which the teachers are themselves uncertain: science, new curricula in mathematics, and languages that are new to both teacher and student. But major difficulties remain to be overcome if educational radio is to be more than half successful. Sets need to be provided, maintained, and supplied with batteries. Teachers need to know when programs are to be broadcast and what the content of each will be. Even for open-circuit broadcasting, some sort of timetable needs to be distributed to schools. At the same time, broadcasters need enough contact with schools to make sure that they pitch their broadcasts at a level that meets the needs of both students and tutors. Straightforward technical difficulties must also be taken into account. Schools in remote or mountainous areas may receive only weak radio signals, while in equatorial regions the propagation characteristics of radio signals cause problems. Listening conditions in an echoing tin-roofed classroom are likely to be poor. The sound quality from a radio with a small loudspeaker is low. All these difficulties reinforce each other.

For vocational training or for equivalency programs, open broadcasting has been used little, if at all. But, programs intended for school audiences are also heard by large eavesdropping audiences. (Even programs as specific as those on school mathematics in Nicaragua attracted an adult audience listening at home.)

Many open broadcasting services devote considerable airtime to broadcasts on agriculture, health education, community development, and other rural issues. Some evidence suggests that these programs reach and influence their intended audiences. For instance, studies in Malawi suggest that some 27 percent of farmers had learned something about agriculture from radio. In northern Nigeria, nearly half the farmers in one survey thought radio the most important source of agricultural information.

Overall, programs on farming and market prices seem to be popular, in many cases as popular as news and music programs. But, as with in-school broadcasting, agricultural radio broadcasting entails inherent difficulties. Often, signals from a medium- or short-wave transmitter will reach an area large enough to encompass a variety of climates, soils, and crops. Advice on agriculture that is right for one part of the area will be wrong for another. Where broadcasts are made in more than one language, the problem is compounded since linguistic and agricultural boundaries do not necessarily coincide.

With respect to many agricultural broadcasts, another set of difficulties arises when broadcasters adopt the wrong tone. Too often, farmers are told what they must do, when they must plant, and how they must harvest instead of being informed about new agricultural methods and the reasons for adopting them. Such didactic instruction makes production easy but listening difficult. In such cases, the listeners may not need instruction, which is likely to be either only too familiar or slightly wrong in the context of the micro-environment, so much as they need explanation and information. At any rate, it is well-nigh impossible to produce useful agricultural programs that will increase listeners' understanding of agriculture if such programs are aimed at farmers who work under quite different conditions and grow quite different

crops from those the programs address. Finally, in any sector of education, there are severe limits to what a single medium can achieve.

So much for the disadvantages of open broadcasting. The advantages are twofold: it is cheap, entailing only the costs of producing and transmitting programs, and it reaches large audiences. The numbers reached by broadcasts are always much larger than the numbers who will enroll in a course or join a learning group. While the costs of broadcasts to schools are generally additional to normal operating costs, the costs per student may amount to no more than a small fraction of the amount spent on teachers or books; similarly, the cost for each adult listener, where no support serivces are provided, may be very low.

Open Broadcasts With Print

Much of what has been said about open broadcasts holds true of broadcasts supported with printed materials. But, even a limited amount of print can provide the teacher or the student at home with a guide to the best ways of using radio, a reminder of what has been said, and a substitute for what has been missed. While supporting materials will not reach all of a program's listeners, they will make the programs more useful and more effective for those who do get them. Of course, there is a price to pay. The costs of producing printed materials has to be borne, so the cost for each listener who receives them is higher than the cost for each listener who tunes in to an unsupported radio program.

Then too, there is an administrative price for printed materials. Since supporting print should relate closely to programs, print and radio need to be planned together. Because the lead times for printing pamphlets or books on the one hand, and producing radio programs on the other, are likely to be different, the decision to link print and radio makes the production of radio programs more difficult.

In schools, print-supported radio programming has been used to enrich and extend the curriculum. It has made it possible for schools to offer subjects that would otherwise not be available to students. And it enables them to present subjects in a different way. In Kenya, for example:

> In the later 1960s, Voice of Kenya began to use a radio series called "Beginning Science" to improve science teaching in the upper classes of primary schools. By 1971 "probably 80 percent of Kenya's upper primary children in registered listening schools [learned] their elementary science through this radio series." Radio seems to have been successful in getting schools to approach science in a new way. The broadcasts were supported by pamphlets, and there were regular visits to schools. (Michael Young and others, Distance Teaching for the Third World)

Other projects have used radio and print to carry a much heavier teaching load. In Mexico, a small experiment--Radio Primaria--used radio supported by print to extend the work of primary schools that could offer only the first few years of the curriculum. In Nicaragua, radio has been used in a much larger number of schools, to a much narrower purpose--teaching mathematics.

In a USAID-sponsored project the primary school mathematics syllabus was revised and radio was adopted as the teaching medium. Since the new syllabus was thought to be beyond the competence of the existing teachers, the intention was to use radio for direct classroom teaching. The radio teacher replaces the classroom teacher in asking children to do mathematical exercises, announcing (after a pause) the right answer, and so on. The children thus learn mathematics without reference to any textbooks.

The use of print with radio has not only made it more convenient for teachers to use radio, it has also contributed to a shift in radio's function. Whereas it started as teacher support and classroom enrichment, with print support radio has increasingly been used to teach children directly, taking over some of the classroom teacher's functions.

Radio with print has not been used on any significant scale for vocational training. But it has been used for some equivalency courses. In Brazil, radio programs help students prepare for the secondary-level equivalency examination, the madureza, and these programs are supported by printed study material on sale at bookstalls. Similarly, in wealthy countries where public service broadcasting exists, radio with print support has been used extensively for adult education. The BBC in Britain, for example, offers foreign language teaching by radio and sells supporting texts. (Sales vary from 12,000 to 200,000 for a term.) Print is crucial in such broadcast programs for teaching and reinforcing grammar and vocabulary and for encouraging practice beyond the limited minutes of a radio program. In general, print-supported broadcasting is widely used in the West for many other educational broadcasts for adults, even where its function is less crucial. However, little evidence about the effectiveness of most such broadcasting is available.

Radio used in conjunction with print is of little relevance to rural education in LDCs, though some agricultural extension services distribute leaflets that give the times and subjects of agricultural broadcasts. Where literacy levels are low and broadcasts are aimed at large audiences of farmers, the value of print is inevitably limited.

Broadcasts with Print and Feedback

If broadcasts supported by print are backed by a tutorial service, then the tutors can lessen the distant learner's isolation. Systematic feedback from the listener to the tutor can be used to help the listener learn more effectively and can also inform the broadcaster about audience reactions.

Commonly, this kind of tutorial support has been provided through the use of correspondence courses linked with radio. In particular, radio and correspondence have been used for the in-service training of teachers. In the late 1960s, Kenya started to use this combination to provide alternative training for unqualified teachers. More recently, Tanzania has adopted a similar technique to train the large number of teachers recruited to implement universal primary education. The National Service for Commercial Apprenticeship (SENAC) in Brazil not long ago conducted promising experiments in vocational training with radio and correspondence.

The combination of radio and correspondence has also been widely used for equivalency courses--those that lead to formal certificates of competence equivalent to those obtained in school. While most such courses are for adults, some have been geared to the primary level. In the Dominican Republic, for example, students of Radio Santa Maria listen at home to radio programs, work on correspondence lessons, and come together once a week with a monitor who collects their work and sends it on for marking. In this way, the adult students can work through a basic education curriculum and take an examination equivalent to that children take in primary schools.

Radio and correspondence have been more widely used in secondary and higher education. In many countries, primary education has expanded much farther than secondary, so that demand for alternatives to regular secondary schooling is widespread. In South Korea, for example, the Air Correspondence High School has followed an earlier Japanese example and is using radio and correspondence for secondary courses. In Malawi, a comparable program is offered: students come together in low-cost substitute schools, often with unqualified or underqualified teachers, and get most of their teaching from radio and print. At university level, a number of LDCs have established open universities, which use radio with other media in alternative education.

Even with arrangements for feedback, radio with print is of limited value for much rural education, since the audience is limited to literate individuals. In India, however, the popular Farm School on the Air has had some success in training farmers; its format consists of weekly lessons read over the radio. Listeners write out answers to the questions broadcast during the program and mail them in for marking.

Broadcasts with Print for Groups

Most of the projects discussed here so far use radio as the junior educational partner to support and reinforce what print or individual study conveys, rather than the other way around. Radio's key role has often been to recruit, encourage, or stimulate students, rather than to carry the main burden of teaching them. For many adults, more support than radio or print alone can provide is needed. For them, some kind of out-of-school group organization is necessary. The techniques of group study, supported by radio, have been used for programs of vocational, equivalency, and rural education--three of which are here considered together.

The idea behind group study is simple. As Michael Young and others points out,

> ...in the last few decades the most important step taken has been to connect radio with organized but informal groups. The radio is used to arouse interest and to convey information; the information and the ideas are then discussed by group members; often the local extension officer serves as a group leader. The combination seems to be a powerful one. It allows the technical knowledge of the teachers or experts, usually from outside, to be combined with and adapted to the local knowledge and environment of the students or forum members. (Distance Teaching for the Third World)

The essence of this method is to use radio with print to carry the main burden of teaching where there are no ordinary schools, and not to provide orthodox in-school education. The Latin American radio schools, which started with Accion Cultural Popular (ACPO) in Colombia, comprise small groups of learners who use radio and print to work their way through a curriculum. While the curriculum is, in many cases, comparable to that offered in ordinary schools so that radio school members can get the equivalent of a basic or secondary education, the pattern of organization is totally different: small groups of students, mainly adults but sometimes adults and children working together, study outside formal schools. Moreover, the radio schools' curriculum is not limited to school subjects. Some schools focus, for example, on agriculture and so can be regarded as vocational. Others focus on health, family life, or religion: these must be classified as nonformal. Finally, the radio component itself is central in recruiting, encouraging, and teaching students.

Radio has also been used with study groups in two other types of application: radio farm forums and radio campaigns. Of the two, radio farm forums have the longer history. In 1940 the Canadian Broadcasting Corporation, together with the farmers' union and national adult education association, launched Farm Radio Forum. Farmers came together to listen to a radio program on a topic of importance to them--more often marketing than farming techniques--and made use of study guides distributed to the groups. Following their motto of READ/LISTEN/DISCUSS/ACT, the groups began by reading the study guide, then they listened to the program, and finally they discussed the program. Each program was intended to lead into group or community action, and reasonably often did so. The series ran for some twenty years, helping farmers overcome their isolation in the cold Canadian winter and leaving behind a record of many small and cooperative initiatives. The same model used in Canada was adapted in the 1950s in India and then in Ghana. Farm forum projects followed in more than a dozen African and Asian countries. All were organized in the same fashion, though some made much sparer use of printed materials.

The existence of a network of forums meant that it was relatively easy for broadcasters to keep in touch with the forum members and to obtain feedback from them for use in program production. For the learners, the idea of having a group leader, who alone needed to be able to read and write, meant that farm forums could educate nonliterate and literate people alike. But in spite of many reported successes, forums always appealed only to a minority of farm families, and these programs worked only if they received sustained support from their members over months or years. Gradually, many faded away.

Yet, the forum movement continues to exist in Ghana and India. In parts of francophone West Africa, radio clubs springing from the French tradition of animation still operate along similar lines. In Senegal, for instance, feedback from radio clubs has played an important role in informing and changing government policy. Reactions from forums have been used there to keep government in touch with peasant needs and interests.

The difficulty of maintaining support for forums over a long period was one of the factors that led Tanzania to take another approach to radio education--the radio campaign. Here, the intention is not to involve a small group of farmers over a long period, but instead to attract into radio learning

groups large numbers of people for a short time. In the Tanzanian campaigns, which focussed on both political and health education, each meeting started with the reading of a study guide. Members then listened to the radio program, discussed its relevance, and agreed on action following it. Accordingly, the impact of the campaign Man is Health has, for example, been assessed in terms of the number of latrines built, stagnant pools cleared away, and so on, and not merely in terms of the number of people who joined study groups.

Since the Tanzanian campaigns have run for only short periods, the decline in support has been less of a problem than it has been with other types of forums. In addition, the campaigns were conceived and launched on so large as a scale that the strong backing of government and party agencies was required to train group leaders, distribute support materials, and deal with feedback from learning groups. This means that the costs of producing the radio programs represents a relatively small part of the total costs, whether measured in terms of managerial capacity or of money. (Table 1 summarizes the way in which broadcasts have been supported and used.)

Table 1: Educational Sector and Uses of Radio

Ways of using radio	Educational sector			
	Schools and colleges	Vocational education	Equivalency courses	Rural education
Open broadcasts	Widely used	Not used	Not used	Widely used
Open broadcasts with print	Widely used	Not used	Occasionally used	Not generally used
Broadcasts with print and feedback	Little used	Some Used	Some Used	Not generally used
Broadcasts with print for groups	Not relevant	Used (Its use here--through radio schools, farm forums, or campaigns--overlaps these three subsectors.)	Used	Used

The Function of Broadcasts

While the functions of radio, especially for open broadcasting, have seldom been clearly defined, at least five can be distinguished. One is to motivate, encourage, and support students. Radio has been used effectively to encourage people to enroll and participate in an educational program and, once they have started, to keep working at it. Studies in Europe have suggested that broadcasting can significantly affect the proportion of correspondence students who keep working on their courses.

The second function is to teach students part of the curriculum. Radio may be used to reinforce ideas and information that are also carried in print or to present those parts of a subject that lend themselves to oral

presentation. Where groups are learning without a teacher, the teaching function of radio becomes particularly important since we cannot be sure that all paticipants in forums, schools, or campaigns can read and write, or that printed materials will always reach them. The third function of radio is to teach students techniques of study, as opposed to subject content. Radio can be used successfully, for example, to teach students how to solve problems in mathematics or how to plan an essay. The fourth function is to inform students about their course and about activities associated with it.

Finally, radio can be used to respond to student problems. If recordings of students can be made or an analysis carried out of difficulties they have encountered in their written work, then this feedback can be used to improve radio programs. This function, of course, overlaps with others: a program on student difficulties will, for example, also introduce some new material and encourage students to continue their study.

Formats

As Bertolt Brecht pointed out, broadcasting developed as a way for central governments and centralized commercial institutions to communicate to large numbers of people, rather than as a means of communication among members of the public. Much broadcasting, whether for education or for development, bears this observation out. Whether in the form of talks, speeches, lectures, instructions, or advice, most educational broadcasting consists of a lecture. Unfortunately, many teachers, community developers, agriculturalists, and rulers have assumed that radio's main value is to give them a loudspeaker that can be heard all over the country. There is no reason to assume that this format is especially effective, but such programming is inexpensive to produce.

Many educational programs, for schoolchildren or for adults, do use a more interesting format--discussions or drama. Interviews, discussions, or dramatizations are likely to be more appealing to listeners, and to be more effective.

A variant of the first format is the advertising spot. Following the example of commercial radio advertisers, numerous countries have experimented with repeated spot broadcasts. Such spots, which last for between 30 seconds and two minutes, are repeated so frequently that they are remembered as clearly as advertising jingles. In general, the most successful of these spots follow four rules. James Theroux spells them out in Techniques for Improving Educational Radio Programs:

1. The first sentence should contain no new or important information (listeners often fail to hear the first sentence of an announcement) but should attract attention (by means of an unusual or appealing voice, an interesting question, or an expression of emotion).

2. Of the 60 seconds, no more than 40 seconds should be talk. The rest should be music, silence, or sound effects.

3. The message or content of the spot should be 90 percent familiar information and 10 percent new (as in dialogue or drama).

4. **The basic structure of a nondramatized message is four-part: introductory sentence, background, bridge sentence, and new information.**

Advertisers stand convinced of the effectiveness of the spot as a way of increasing sales, but its value for education is harder to substantiate. First, many educators argue that education consists of far more than drumming repeated messages into listeners' heads. Second, the results of one experiment carried out by an advertising agency in the Philippines suggest that even with intensive advertising over a year, only a minority of listeners are persuaded to change their children's diet as recommended and that the costs of reaching each family are relatively high. This finding is consistent with theories of communication that suggest that human interaction, as well as the receipt of "messages," is important in getting people to adopt innovations.

Perhaps we all chafe at restrictions on our means of communication. At any rate, we can see all the other radio formats besides dramatizations, lectures, and advertising spots as attempts to increase the radio audience's involvement by transcending the limits of a one-way medium. Radio producers have tried to do so in three ways -- directly (by inviting listeners to respond aloud during each program), vicariously (by getting listeners to identify with the characters of a broadcast), and representatively (by enabling some proportion of the audience to take part in the program).

Of these three methods for involving the audience, direct involvement is the rarest. Most broadcasters have felt that time is at a premium and have been reluctant to broadcast silence or background music while listeners solve a problem or shout out their answers. Yet, this technique has worked. In Nicaragua, children learning mathematics at school responded out loud to radio programs. In Honduras, students of the radio school Accion Cultural Popular Hondureña (ACPH) were given themes to discuss among themselves or with their group leader, while the radio played background music. In other radio schools, learners write answers to exercises in their workbooks during pauses in the radio lessons.

Vicarious involvement, the second approach, is much more common. Many programs have been cast in dialogue form. Some stations feature two speakers, a man presentor and a woman presentor, who alternate in the role of student and teacher. Then too, programs can be dramatized to personalize the issues and to enable listeners to identify with their radio protagonists. From simple drama has come the idea of the educational soap opera, in which the views of educators, agriculturalists, or community development workers are embedded in a serial. The Archers in Britain has been running for thirty years, with an episode every weekday. It offers information mainly, but not solely, on agriculture, and it still attracts and influences audiences. (Doctors were astonished recently by an exceptional demand for tetanus immunizations after one character in The Archers developed tetanus.) The strength of the format is clear. The problem often lies in finding enough scriptwriters and enough ideas to keep going day after day or week after week.

Various techniques have been used to involve representatives of the audience in programs. One is using recordings of students as the basis for programs. In Ecuador, for example:

> Members of the radio schools of "Radio Mensaje" regularly make their own programs, which expose the issues that matter to listeners and reflect their local culture. These programs were experimental at first, but quickly became so popular that more air time was given to them. Programs are made from material recorded in villages and edited at the radio station. Up to 40 village groups are loaned tape recorders and send in their own choice of recordings. The programs appeal to an audience very much larger than the few village groups participating. (Janet Jenkins, Materials for Learning)

Request programs of various kinds have also been used with some success. In Botswana, for example, a radio series called Re botseng (Ask us) was launched as a successor to the 1976 radio learning campaign, and soon started receiving a steady flow of inquiries about the work of all government departments. In Costa Rica, a regular program on sex, Dialogo, has generated and made use of a steady flow of correspondence from listeners: very popular, it appears to attract the less rather than the more educated, and it may even have contributed to the decline in the birthrate in the 1960s and 1970s. Music request programs have also been run by educators in an attempt to associate their subject matter with the popularity of the music they play. The extension aids service in Malawi uses this approach, while other agricultural music programs intersperse music with advice on agriculture. In the Solomon Islands, Teachers' Tea Time has received an average of seven letters from each school in its area: as well as overcoming some of the isolation of scattered teachers, this also gives teachers a chance to comment to the schools' broadcasting service on their work.

Finally, representative listeners can be involved in an educational quiz show, which as James Theroux points out,

> can be interesting and informative as its questions and answers convey information on a certain theme. The attention of the listeners is retained both by natural interest in a competition and by auditory stimulation through the use of buzzers and bells for right and wrong answers, recorded applause to create a feeling of immediacy, and so on ...
>
> The quiz show can transmit concrete facts, especially on subjects with which the audience already has some familiarity. (James Theroux, Techniques for Improving Educational Radio Programs)

Little firm evidence suggests that one format has clear advantages over another. But what evidence there is does suggest that language is all-important --regardless of which format or medium is used. Beyond that, it has been demonstrated that the effectiveness of the straight talk or lecture has clear limits, especially for people who have had relatively little formal education.

Obviously, it is also important to make a program interesting: we learn more effectively if we are not bored. But of the comparative effectiveness of different ways to make a program interesting, or to maintain students' involvement, little is known.

Costs

Analyzing the costs of radio for education, educators should distinguish between four types of expenses. They are the cost of producing programs, the cost of transmitting them, the cost to the listener of receiving them, and the cost of organizing support for to them (through, for example, the production of supporting materials or the organization of group study).

Table 2 : Estimated Costs Per Hour of Open Broadcasts

Country	Date of Information	Cost per hour Production: Constant 1978 US $	Transmission: Constant 1978 US $	Production and transmission: Constant 1978 US
Tanzania a/	1979	408	109	517
Nepal b/	1975	99	64	163
Mexico b/	1972	179	22	201
YugoslaviA c/	1978	n/a	n/a	96
Shetland Isle (Britain) c/	1978	n/a	n/a	427
Malawi d/	1980	n/a	n/a	830

Notes

a) D. Mbunda and A. B. Edington (1979), Educational Media in Tanzania (n.p., British Council, London), using a 5% discount rate and taking 8.074/- = $1.00.

b) Unesco (1977) The Economics of the New Educational Media (Unesco, Paris), using a 7.5% discount rate.

c) Richmond Postage, and Others (1979), Low Cost Communication Systems for Educational and Development Purposes in Third World Countries (ITDG, London/Division of Structures, Content, Methods and Techniques of Education, Unesco, Paris).

d) Interview at Malawi Broadcasting Corporation, May 1980, taking KO.81 = $1.00.

Estimates of the cost of producing and transmitting programs should be fairly easy to make. Yet, the figures available vary widely, in part because the same goods and services cost differing amounts in different parts of the world, and in part because the approaches taken by the economists who make such projections differ in sophistication. The same procedure has not always been used, for example, to deal with rent, amortization, and depreciation. (See Table 2.)

Estimates for reception costs are even more difficult to calculate, since these vary not only with the economic condition of the country in question, but also with the number of listeners who use each radio set and with the number of hours a set is used. Estimates in Tanzania suggest that the reception cost per pupil per hour in primary schools varies between US$0.00171 and US$0.00204. These figures seem to compare favorably with the costs of teachers' time and with the costs of print. Thus, the total annual cost of primary school broadcasts was estimated at US$0.79 per child compared with a cost for textbooks of US$5.70. For Malawi, the cost per listening farmer for an hour's agricultural broadcasting is US$0.0037.

The costs of using radio with other media have been calculated for a number of projects, notably those using a correspondence link to provide courses leading to examinations. In these cases, the costs of using radio can be compared with the costs of regular face-to-face education, but such a comparison is not possible for much educational broadcasting since the aim of the programs is seldom the same as the aim of any face-to-face teaching alternative. (See Table 3.)

Table 3 : Costs of Multi-Media Courses Using Radio

Project and country	Date	Cost per enrollment in constant US$ - 1978	Education level	No. of enrollments at time of report	Comparison with cost of alternative
Malawi Correspondence College a/	1978	160	Secondary	2,880	Cost per enrollment lower than school; cost per graduate higher than day school but lower than boarding school
South Korea: Air Correspondence High School a/	1977	64	Secondary	20,000	Cost per enrollment and per graduate lower
Kenya: In-service teacher training a/	1977	322	Secondary	790 c/	Cost higher than alternative
Dominican Republic: Radio Santa Maria d/	1975	5	Primary/ basic for adults	20,000	Cost per enrollment and per graduate lower than alternative
Tanzania: wakati wa furaha radio campaign f/	1971	0.85	Adult	20,000	No direct comparison possible
Botswana: Tribal Grazing Land radio campaign g/	1976	10	Adult	20,000	No direct comparison possible

Notes

a/ Hilary Perraton, ed. (1979). Alternative Routes to Formal Education: Distance Teaching for School Equivalency (mimeo, World Bank, Washington, D.C.)

b/ This is a cost per student per year.

c/ This figure represents subject equivalency enrollments, not individuals: one student may study more than one subject at a time.

d/ R.A. White, "The Use of Radio in Primary and Secondary Formal Education: the Radio Santa Maria model in the Dominican Republic," in Dean Jamison and others, ed. (1977), Radio for Education and Development: Case Studies (World Bank, Washington, D.C.).

e/ White estimates that the real cost, as opposed to actual expenditures, if RSM worked as a government agency, would be $24 per student per year, as compared with a cost in government schools of $39.

f/ Budd L. Hall and Tony Dodds (1974), Voices for Development: the Tanzanian National Radio Study Campaigns (International Extension College, Cambridge).

g/ Ministry of Local Government and Lands (1977), Lefatshe 12 rona: Our Land (Ministry of Local Government and Lands, Gaborone).

As the figures set forth in Table 3 suggest, the cost of education through radio with some kind of print or group support may be lower than the cost of orthodox education, but it will not always be. Using radio and print or group discussion is much more expensive than open broadcasting. But the figures must be treated with caution for two reasons. First, all the costs of broadcasts in these calculations are attributed to the enrolled students; yet, a significant general audience exists for and benefits from even the most narrowly conceived educational broadcast. Second, while the total costs of using radio with print and group support are clearly greater than the costs of using radio alone, these higher costs need to be viewed against the alternative ways of meeting a similar objective. Alternatives to the work of ACPO in educating rural peasants in Colombia, for example, do not lie in putting out radio programs without any support. If a comparison is needed, it must be made with the costs of expanding basic education to all. (One such attempt has been made: the costs of the Tanzanian campaign Man is Health have been weighed alongside those of producing the same results using government labor for construction.) While such comparisons cannot be precise, making them should help educators and other decision-makers to avoid interpreting the figures in Table 3 in too simple a fashion.

Conclusions

Radio has been used extensively to stimulate and further both education and development. But, for the most part, it has been used haphazardly, with little sustained experimentation or research to guide it. Over the last twenty years, television has aroused far more interest than radio, although its audiences have been far smaller. Meanwhile, different ways of using or supporting educational radio and different formats for broadcasting have developed in different parts of the world in comparative isolation from each other--on open radio here, a farm forum there, or a radio school somewhere else.

Two consequences follow from the long-time neglect of radio's full potential. First, the scope for extended trials and experiments with the whole range of educational radio broadcasting techniques remains immense. Second, a number of ways of using radio are underdeveloped. Supported by correspondence, radio has been widely used for few professions other than teacher education. Clearly, much of its potential remains untapped.

Overall, plenty is still to be learned about radio. We need to know more about program production and, in particular, about choosing formats for particular educational purposes. But even more important, we need to know much more about the way radio is received and used.

Also appropriate here are some positive, if obvious, statements about the power of radio. First, the development of the transistor means that radio now offers an easy way of reaching large proportions of the populations in most countries of the world, no matter how poor. Over the last two decades, the proportion of the population reached by radio has in many countries probably risen from around 10 to 20 percent to somewhere near or above 50 percent. Second, it is easier to distribute information via radio than through any other mass medium, including newspapers. Third, radio can reach the nonliterate as well as the literate. Fourth, radio is far cheaper than television, and it

reaches larger audiences. Moreover, as with any mass medium, the costs of making and distributing programs do not rise with increases in the number of listeners. Educational broadcasting can, therefore, achieve economies of scale impossible for orthodox education.

Radio's ability to reach large audiences presents broadcasters with two additional questions related to scale. First, to what extent can any program be both specific enough to meet the needs of a particular audience and general enough to justify its place in a schedule of broadcasts reaching hundreds of thousands or millions? As summarized at an International Extension College workshop in 1977, the problem is "Somehow ... to reconcile the need to decentralize with the need to achieve economies of scale. Problems here are increased by linguistic differences, as well as by cultural and agricultural differences..." Second, how far should radio's energy be concentrated on reaching the largest numbers, through open broadcasting, and how far on teaching with the greatest effectiveness? There is no simple answer here, but one approach is to create links between programs and routes for the most committed members of a radio audience to become members of learning groups. The same program can, after all, often meet the needs of a larger, general audience and of a smaller, more committed one. And links or routes of this kind can help solve our first problem, that of matching a broadcast program with the specific needs of one audience.

How we develop these links remains an open question: we are still a long way from having a formula to use to choose between alternative ways of doing so. Nevertheless, the educational future of radio depends on the subtlety and strength of the links that can be developed between it and various forms of face-to-face learning.

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CHAPTER V

CHOOSING INSTRUCTIONAL LANGUAGES FOR EDUCATIONAL RADIO BROADCASTS IN LESS DEVELOPED COUNTRIES*

Although the focus of this essay will be on the selection of appropriate teaching or instructional languages and the potential of radio for education in Less Developed Countries (LDCs), two other associated but neglected issues must first be addressed briefly. One is the rationale of specialists from industrialized countries who offer suggestions to policymakers in LDCs. The other is the reflection of educational aims in the content of instructional programs transmitted over the mass media as part of a development program.

A Rationale for Giving Advice to LDCs

Members of a society said to be more advanced not only in technology but also in science, systematized thought, and knowledge must at times ask what they have lost or never developed. It is saddening that some youngsters now think butter comes from the supermarket. But it is thought-provoking too, making us worry about what might be forfeited or lost from the lives of people in LDCs as the need for technology increases the demands for change and for education.

Yet, sharing ideas and knowledge across cultures need not eradicate nor come into conflict with traditional culture. For example, as Dart and Pradhan conclude, modern science can be taught as a "second language" or a "second culture." It follows from this, of course, that the enrichment can work both ways, that the scientifically sophisticated American student should profit from a sensitive introduction to traditional LDC interpretations of physical phenomena.

Besides the problem of destroying the learner's cultural heritage is that of neglecting it in curriculum. All too often, the content of education is given less attention than the form--the ways educational materials are presented, including the selection and use of the languages of instruction. Regardless of which instructional languages or educational media are used, the fundamental educational planning issue is the clarification of the aims of education and the introduction of these aims into a curriculum that embodies a societal context and both social and personal values. To take this idea a step farther, the ability to derive knowledge from one's own cultural and ecological system, to appreciate the values implicit in what is taught, and to follow the formalized presentation of this knowledge and the associated values constitute the aims of education.

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* This chapter was written by Wallace Lambert and Nelly Sidoti.

The more effectively these components of content are blended, the more significant the educational program becomes. To neglect or omit a component is "half-teaching," which can have devastating long-term consequences. Consider, for example, the typical education Westerners receive about India and Indians. The belief that it is backward or stupid not to eat cows--sacred or not--when starvation is rampant is held only by those who do not understand the religious, social, and even economic importance of cows in India's ecosystem.

In LDCs, the importance of shaping and recognizing educational values is especially great. If curriculum is not linked to local values, foreign values and ways of life appear as though they were being pushed as an alternative to the local.

Social and Psychological Considerations

In many LDCs, many home languages or mother tongues* are to be found within a single community, especially in rural communities that are far from a major center. For rural people from multi-lingual environments, the choice of the language of instruction can itself determine how much and what is learned. Therefore, the selection of appropriate instructional languages must take into account concerns about language and the roles it plays in the cognitive development and social comportment of children, in the social relationships between and among ethnolinguistic groups, and in the relationships of groups to nations. Beyond that, the assumptions usually made about these roles need to be tested against experience.

At an international conference on bilingualism in the early 1960s, a debate developed over which language those teaching Lappish immigrants should use for instruction. A Russian applied linguist presented the "democratic" viewpoint that the Lapps, like all newcomers to the socialist family of nations, should be taught in their own language. But this argument was vigorously opposed by a Swedish linguist who contended that rather than linguistically isolating the Lapps, it was preferable to integrate them into Swedish schools from the start so that they could progress in any direction in the Swedish society.

At a similar international meeting in France in the late 1960s, one delegate delivered a passionate plea for the maintenance of every ethnolinguistic group's language and its culture. But a sociolinguist and language planner from India took another view, saying that in India he was trying his best to help "kill off" languages that "keep cropping up like weeds!"

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* "Mother tongue" is used here in a nontechnical sense to refer to that "home language" or "native language" that is used by parents in the early socialization of the child. It is not necessarily the dominant language for the child or the parents.

At a language planning session in the 1960s in Manila, the local delegates argued for the need for one language for schooling, since at that time over 70 different mother tongues were being spoken in the Philippines and teaching in all was impossible. The irony? In the 1960s, practically all elementary education was being conducted in English, which was not one of the more than 70 home languages.

Before these problems can be approached, a number of myths about language need to be dispelled. Stanley Lieberson, a sociolinguist, reanalyzed the research data linking mother tongue diversity to a nation's economic and social development and found that linguistic diversity is not linked to a lack of national development. Another widespread belief without substance is that bilingualism is a handicap to cognitive development. Recent work establishes that bilingualism can actually be cognitively enriching and stimulating. Consider too the popular belief, referred to as the "ethnocentric" assumption, that the more positive the attitudes are toward one's own ethnolinguistic group, the more negative the attitudes are toward outgroups. This belief, so relevant to the matter of mother-tongue maintenance, group identity, and national integration, is now being challenged. The countervailing "multicultural" assumption is that positive attitudes and tolerance toward other cultural groups derive from a confidence in one's own cultural identity.

Other anecdotes direct our attention to the child in the school setting, perhaps the most important reference point of all. Academic literature reflects the assumption that children learn better if taught in their mother tongue. At the same time, a long-range Canadian experiment on "early immersion" schooling (wherein some language other than the mother tongue is used as the language of instruction for the large part of the elementary school years) indicates otherwise. Repeated evaluations show that Anglo-Canadian children easily follow a French immersion program in their elementary years and achieve as well in the content subjects, in English language development, and in general cognitive growth as do Anglo children who attend conventional mother-tongue schools. In the process, those following the immersion programs become functionally bilingual to boot. Parallel studies show that "double immersion" programs--where <u>two</u> foreign languages (French and Hebrew) are used as instructional languages on alternate days for Anglo-Canadian youngsters--produce the same advantages as the single immersion programs and, like them, have no negative effects on English language development.

These outcomes can be attributed to the fact that English enjoys higher prestige, utility, and prominence in Canada than does French, so Anglo-Canadians can acquire facility with a second language without worrying about losing Anglo-Canadian identity. However, and this is critically important, this is <u>not</u> so for those who do run a risk of identity loss, as is the case for Franco-Canadians and for most "hyphenated" American groups. For these threatened groups, bilingual development in English is most likely to be "subtractive" in that English could swamp and push aside the mother tongue. For those running such a risk, mother-tongue instruction could well be absolutely essential for the maintenance or development of a sense of identity, of worth, and of belonging. (Incidentally, worldwide, those facing "subtractive" in contrast to "additive" biligualism are probably in the majority.)

North American public schools are the setting of numerous anecdotes about publics whose mother tongue is other than the language of instruction. Often, these students are placed in "special" classes and treated as though they were mentally deficient because they have an accent and cannot speak English perfectly. As demonstrated by recent empirical studies, this lack of native-like command of the school language can have devastating effects on pupils. It can, for example, reinforce the biases of teachers who, by means of the grades they give to and the types of interactions they initiate with such pupils, can discourage them in their attempts to achieve.

What do these anecdotes tell us about how to choose appropriate instructional languages for LDCs and to adapt instruction for radio? Most important, major emphasis should be placed on sociocultural and psychological factors in making such choices. This does not mean that in attending to local sociocultural factors we should negate foreign alternatives. Indeed, modelling programs in LDCs after developed-country techniques that have a high achievement record makes good sense. For instance, such adaptation offers great possibilities for the development of instructional radio programs. Still, caution is called for in such modelling because too often educational programs developed in industrialized countries flagrantly neglect educational purposes and content relevant to LDC needs and conditions.

General Principles

A careful examination of actual examples of nations faced with choosing a language for instructional purposes leaves the impression that nation-to-nation variability permits no general guidelines. Each case seems unique. Nevertheless, instructive prototypical cases do exist, and from these general principles can be extracted.

Take, for instance, the case of mother-tongue instruction. While a child's mother tongue seems the logical choice of instructional language, this seemingly pedagogically sound principle does not always hold up in practice. In the case of immigrant pupils, for example, the value, prestige, or career potential of the mother tongue relative to that of the host community's language comes into quesiton. There are many other socially and politically complex reasons for choosing a non-mother tongue language for instruction as well. Even for learners who aren't immigrants, some language other than the mother tongue may be more prestigious (locally, nationally, or internationally) than the mother tongue. Conversely, the mother tongue may have negative associations tied to it so that facility in its use may not lead to wide social or economic opportunities. By definition, the less prestigious language is thought to be limited in its capacity as a code for the expression and explication of complex technical or scientific ideas. Then too, the belief is widespread that a particular language of instruction, especially a "world" language such as English or French, gives students access to Western patterns of thought and thereby prepares them for study in an advanced Western nation.

Besides the special problem of immigration and the question of language prestige, there is also the issue of the neutrality of a given language as used for educational purposes. The use of a "world" language or a widely used regional language could be preferable to that of one or more

indigenous languages that for historical reasons have become too emotionally or politically charged to unify ethnolinguistic subgroups in pluralistic societies.

These pressures to decide on a language other than a mother tongue for instruction increase with the number of mother tongues peculiar to a state, region, or locality. According to a survey conducted in Uganda by Stephen Heyneman, an average of three or more mother tongues can be represented in the classroom.* Educational planners tend to argue that in such cases one could never satisfy all pupils and parents, and thus a choice of one among the many is both logical and practical. Reasoning in this way starts a search for rationales for the best choice among the alternatives, but it is a mistake to assume that the "one among many" solution is the only or the best solution. Choosing a subset of languages in a particular multilingual setting--the "some among many" option--is an intriguing alternative.

To summarize, the search for the appropriate languages of instruction is complicated by false but ingrained assumptions that pervade the academic literature, by ideology, and by social pressure. Further, underlying the range of viewpoints on the subject are attitudes, stereotypes, emotions, and beliefs surrounding each language's prestige and neutrality. Another key issue surrounding this choice is the number of languages that might be considered for instructional purposes: the choice of one from the many alternatives, some from the many, or all. This issue might be singled out as especially important because it raises the further possibility that bilingual or even multi-lingual educational programs might be needed--a need that radio instruction might be particularly helpful in addressing.

Sociological Constraints

If one of the constraints on language choice is the multiplicity of mother tongues of equal social importance, the time available in LDCs for elementary school becomes a particularly critical issue. Considering how few pupils who start school stay in, school attendance in grades one through three is all that planners in most LDCs can count on. Of course, this three-year time limit could be seen as a challenge for educators who want to push this limit upward by enhancing the social importance of and the family's involvement in schooling. But if this limit is instead accepted as a given, educational priorities change and the choice of teaching language is seen clearly to be linked with the issue of what is to be taught.

The three-year limit is linked as well with other urgent constraints upon education. According to a 1980 World Bank Education Sector Policy Paper, in most LDCs about one-third of all children of primary school age are not enrolled in school, only one-third of those age 12-17 are in school, and about one-third of the adult population is nonliterate. And despite enormous educational developments, the report concludes, "unless the rate of expansion of educational opportunities improves, the total number of out-of-school children will significantly increase during the next decade."

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* Mr. Heyneman counted mother tongues, rather than languages or dialects.

Educational Constraints

With this background, the need to deal squarely with the content and the aims of education while exploring the question of choice of instructional languages becomes evident. If we recognize the three-year in-school limit and the problems identified by the 1980 World Bank Education Sector Policy Paper, every moment in school seems that much more precious. In this light, slowing down the learning process by forcing students to master a foreign language or to work at half speed in a second language may seem unconscionable. Yet, might not the choice of a particular teaching language reduce the pressures of the three-year limit and improve the lot of the nonliterate and the out-of-school? Possibly, if the language chosen helps the average pupil to organize and clarify what is taught, or if its use enhances the pupil's sense of identity and personal worth, or if the choice increases the pupil's and his family's incentive to keep him in school more than three years.

How, then, can the content of education for the majority in LDCs be developed and improved? And how might the choice of teaching languages come into play? At the most general level, educational content should be delivered in the mother tongue wherever possible, be oriented toward the child's cognitive development and enrichment by building on life experiences, compress material into manageable and self-contained instructional units easily adaptable to radio instruction, and be encyclopedic in scope. Besides opening children's minds to the wonders of the world and of the human intellect, this form of basic education might also provide the seeds for personal development and insight, sparking the desire to continue learning. In addition to presenting the "great ideas," such a program should provide for future education (whether formal of self-directed). Toward this end, some widely used indigenous language should be introduced cautiously in the three-year period, either through direct instruction in that language or indirectly through the introduction of some subject matter in that language.

This approach calls for enriched educational content in which the mother tongue (or a well known second language) is used as the main instructional medium while necessary provisions for learning another socially useful language are made. The format of the educational content becomes crucial if the goal is to motivate the community to extend schooling time beyond a three-year minimum or to encourage older children and adults to return to formal and informal education. (Here, the use of radio or television warrants exploration since not much can be done in three years in conventional educational programs.)

The educational aims proposed here highlight the interplay between the choice of curriculum content and the choice of an appropriate instructional language. The World Bank proposes that the content of curriculum should be modified "to reflect the structure and dynamics of knowledge, to match the developmental nature of the learner, and to relate the curriculum to the learner's environment," and that these reforms should anticipate and allow for improvements in "instruments and resources to meet basic educational needs by adopting a flexible approach to educational modes of delivery within the context of the prevailing social structure, and utilizing local personnel and community organizations." The Bank-proposed approach would include as well

innovative instructional materials, remedial pre-school preparation, and the judicious use of the mass media, with emphasis on "distance learning."

Realizing these aims and the reforms they entail means according priority to the use of mother-tongue instruction wherever possible, not only because of the time-in-school limitations but also because of the need for equality of educational opportunity. To create a curriculum that will meet the educational needs of all levels in a society in which three years of schooling is the norm, the language of instruction must be the most functional and the least opaque possible. At the same time, educators have to prepare for and counteract the negative motivational influence of "elite closure," whereby elite groups maintain power and privilege both by diverging from the masses in their use of language and helping to ensure that use of the elite-favored language is a condition of wielding power.

Prototype Cases

Various language policies in effect in both industrialized countries and LDCs can serve as models or points of departure for LDC educational planners. The examples presented here range from cases where politics and ideology undergird authoritative policies that seem relatively closed to change and experimentation to cases where flexibility and trial-and-evaluation are built into policies that actually invite change.

The Russian approach. For interesting ideological reasons, post-revolutionary Russia's educational system is based on instruction in the native language. In the mid-1930s, primary school attendance was made obligatory--an enormous feat for the USSR at that time, especially given fairly widespread illiteracy in some soviets. The number of minorities with distinctive languages was large; some spoken languages had no written form, while others had complex scripts; and teachers had to be trained, textbooks written. Today, 130 native languages are in use; books are printed in 89 languages; and as of 1972, some 57 different languages of instruction are used. The academic and occupational achievement of members of ethnolinguistic minority groups and of women in particular is remarkable. In brief, say Blumenthal and Benson, instead of trying single-mindedly to prescribe one dominant language, the Soviet authorities see to it that the schools offer instruction in a large number of local languages. This does not mean, of course, that there isn't one dominant language in the USSR. The point is that language skills in the first instance are often most easily built on the basis of local language.

The Russian approach stands as an example for basic and primary education. It also facilitates the gradual introduction first of a national language and later of other world languages. But the approach has potential difficulties. Starting with a language other than Russian could handicap students, and mother-tongue instruction could restrict the opportunity of some etholinguistic minority groups.

The Philippine approach. A new bilingual education policy has evolved recently in the Philippines. In 1974, the Secretary of Education and Culture introduced the new plan by saying that

> Bilingual education is defined operationally as the separate use of Pilipino (P) and English (E) as media of instruction (MI) in definite subject areas. Arabic shall be used in the areas where it is necessary. The use of E and P as MI begins in grade 1 in all schools. The vernacular is an auxiliary medium of instruction in grades 1 and 2. English and Pilipino are taught as subjects in elementary and secondary schools. Pilipino is MI in social studies/social science, character education, work education, health education, and physical education. English is MI for all other courses....

This, then, is an interesting linguistic compromise that offers a prestigious and useful world language, English, along with one regional language, Pilipino (which is actually an adaptation of Tagalog, one of the seven or eight most widely used indigenous languages). However, few if any children would have English as a mother tongue and only a small proportion of Filipino families use Tagalog as a mother tongue or home language. Thus, the basic and primary education programs are for the large majority being presented through the filter of an unknown language, even though one or more local languages may be used as well. Odds are high that more than one native language would be represented in any particular classroom, and thus some choice must be required, at least the choice of what Sibayan calls a "regional lingua franca."

The Filipino approach is flexible, and judging from the serious concern of Filipino educators in language issues and in language experimentation, with continued evaluation improvements are sure to occur. Thus, Tagalog may in time be given relatively more emphasis, and certain local languages may come to play a larger role, especially in primary instruction.

African approaches. The policy toward instructional languages in Africa varies, and this variance reflects differences that existed in the perspectives and the attitudes of former colonial authorities. Indeed, research shows that whether local languages are used today is determined largely by whether the colonizers encouraged their use, the extent to which current attitudes reflect those of colonial powers and, thus, which languages are used by whom, for what purpose, and where. Nevertheless, in all of sub-Saharan Africa, indigenous languages are used for instruction only in primary education and adult literacy efforts. Even in Tanzania, the official national language (Swahili) is only beginning to be used as an instructional language at the secondary level.

The Case of Ghana. G. Ansre gives a clear description of the Ghanian approach and of its prospects for the future:

> Closely associated with the program of teaching of Ghanian languages as a subject is their use as media in the primary school. Here, the major preliminary task was one of molding the attitude of government and educational authorities. Liaison work with several political regimes and ministry officials has been both exciting and frustrating at different times. However, it seems clearly established that Ghana will use the indigenous languages at least for the first three years of the public school system, and more, if possible. (Ansre, 1978, p. 294f.)

The problems encountered in developing this approach are finding and training teachers, maintaining the quality of teaching materials, and selecting a managable number of languages of instruction. Interestingly, the success of the approach seems to hinge on such factors as the attitudes held by and the incentives given to authority figures, pupils, and pupils' families.

According to Ansre, the Ghanian approach is based on a belief that "African countries can achieve maximum development in the field of economy, politics, civic and human rights, and sociopolitical self-realization only if they use the language which the average person used." As for the chance of success in the use of indigenous languages in Africa, Ansre cautions:

> But we must be realistic enough to appreciate the seriousness of the impediments....The most serious are the existence of many languages in any given country and the negative attitude of the educated to the indigenous languages as against the European languages. To deal with these problems, one has to change the linguistic, social, and psychological habits of the people. (Ansre, 1978, p. 296f.)

The Ghanian approach attaches major importance to the attitudes of political and educational authorities and of local populations toward the use of indigenous languages for instruction. There is also a sensitivity shown to the social stereotypes that become associated with particular indigenous languages. In Ghana, five indigenous languages are used for instruction for primary-level schooling (where the worry about the three-year limit is strongest), and in the post-primary years English is used increasingly. Carefully prepared materials are worked up in a base language (English) and then translated into any number of indigenous languages. Here, of course, the key questions are the efficacy of the curriculum, especially for the majority who will leave school after three or so years, and the method by which indigenous languages are chosen for instructional purposes. (In particular, we need to know how much field research was done on the attitudes of pupils and their parents toward alternative languages, and on family aspirations vis à vis the education of children.) Finally, the Ghanian approach remains open to possible changes in language policy, and such openness can work in two ways: either indigenous languages become used more extensively in instruction or they give way to English or a regional lingua franca.

The Cases of Tanzania, Kenya, and Uganda. In these three East African nations, language instruction policies reflect pre-independence histories, especially the attitudes of colonial authorities.

In independent Tanzania, Swahili was made the national language. To keep wealthier Africans from sending their children to English-medium schools, the government made Swahili-medium primary schools the only option for citizens. Then, President Nyerere called for a system that would take students with newly acquired skills and ideas back to their rural settings. Thus, as Scotton reports, Swahili was chosen

> as a vehicle to break with the individualistically oriented competitive education system of the capitalistic world and with its language, English. To date, education above the primary level is still in English...(and) plans call for the gradual introduction of Swahili as a medium at least in secondary schools. Lack of trained teachers and materials stand in the way at the moment...Swahili is a leveling language which has unified Tanzania's diverse peoples into one nation. It has opened up opportunities for participation in government and business to many individuals who would have no similar opportunities in a society in which English was the official language. Swahili is being used... as a tool of political and socioeconomic integration. (Scotton, 1978b, pp. 728-29.)

Kenya and Uganda. In these neighboring nations, English remained the official language until the mid-1970s. In 1973, Swahili became the national language of Uganda, and in 1974 it was made the official language of parliamentary debates (although English is still the language of schooling) in Kenya. But note the reason for choosing English over the alternatives available. As Scotton points out, "a language which is uniformly less known throughout the country should have priority as an official language over a language which is well known if it is well known by only one section of the community." This makes English uniformly unfair since no one ethnic group is favored. Thus, until the mid-1970s, a uniformly unfair language had been made the official language and the major language of instruction for purposes Ali Mazrui describes as "national integration." And now that the switch has been made, it remains to be seen whether egalitarianism in academic and occupational attainment follows.

These African examples, then, help illustrate the varieties of approaches in vogue, the movements toward or away from the choice of a small number of mother tongues, a regional lingua franca, or an international language as the language of instruction and as the official national language.

The Case of Curacao. A final example is Curacao, where a creole language is now contending for at least equal status with a national (or international) language imposed in colonial times. On Curacao, an island in the Netherlands Antilles just north of Venezuela, Dutch has been the official language and the basic language of instruction. Few natives of Curacao would have Dutch as a home language or mother tongue; for them, mastering Dutch is the price of financial survival, and especially for economic mobility via advanced training (in Holland). Papiamentu, a Spanish-Portuguese-based creole, is the language most islanders use. It is a language of poetry, song, and theater, and both affection and pride are associated by all classes with its use. Of course, the elite is always multilingual in some combination of Dutch, Spanish, English, and Papiamentu, whereas the majority is more limited to Papiamentu. Yet, Curacao's educators are considering the merits of bilingualism because Papiamentu, cohesive a force as it is, might be said to go nowhere since few nonresidents use that language and since the time to decide on legal independence from Holland is approaching. Putting Dutch down in any way might be too strong a sign of a desire for independence, and independence may greatly reduce the island's financial standard of living, at least initially. It might

turn out, however, that some form of Papiamentu-Dutch bilingual education can be achieved, similar to Frisian-Dutch bilingual primary schooling in Freisland, although a convincing argument can be made for the need for more general and extensive social changes to accompany or precede such a move.

Guidelines for Selecting Languages of Instruction

In general, three issues are associated with choosing instructional languages, though any number of local issues may need to be taken into account. First, the urgency and social importance of making well-considered decisions about languages of instruction can scarcely be exaggerated. Second, such decisions can take a variety of forms. Third, the personal and social consequences of making such decisions must be anticipated and made as positive as possible. Once these three cross-national issues are identified, the challenge is to integrate them.

Who is to make the selection, and how? It is easy to conclude that local experts should make such decisions because they are on the spot and they know the situation. Yet, the local people affected by the policy may lack the training needed to decide what is best for them or their children. However, if it is assumed that social groups usually gravitate toward good decisions on their own, then the views of the people (including those of the parents of young children) should help determine decisions about the language of instruction, and the responsibilities for the choices should be shared by local authorities and the populace.

In the case studies reviewed here, the local populations were not surveyed or consulted before the choice of instructional languages was made. Had they been, some of the drawbacks associated with each of these approaches could have been mitigated. Indeed, the key recommendation here is that pupils should help choose the language of instruction because they have valuable ideas and steadfast attitudes about languages and about their social aspirations, and because their views at the onset of a program can be valuable reference points for comparisons made as the program evolves.

Since educational programs are successful only when the potential learners are highly motivated, ready to learn, and offered a program of study that matches their expectations and motivations, the matter of language choice boils down to the question of which language or languages are most motivationally charged and which are most likely to stimulate intellectual growth. More systematically, the choice hinges on maximizing cognitive value, status value, social power, and "past future" value.

The cognitive value of each language equals its potential to facilitate (rather than filter) learning for young people in a particular setting. The cognitive value is the foremost criterion because such temporal limits as the "three year constraint" operate to ensure that the content of the instructional programs is partly determined by and also partly determines the language choice. Content should be geared to cognitive growth (or what Bruner has referred to as "cumulative constructionism") rather than the simple accumulation of facts ("episodic empiricism"). It follows that the best possible linguistic

vehicle for cognitive growth is the mother language of widest access known to the learner since "input clarity" is greatest in a thoroughly understood tongue, since being coerced socially to put aside the mother tongue for some other more prestigious or useful language can induce "subtractive bilingualism," and since those subject to subtractive bilingualism are the very people who most need to raise their receptive and productive capacities in the mother tongue. In contrast, if a threshold of basic competence is reached, research suggests, all the cognitive advantages of full bilingualism are potentially available, and the cognitive skills acquired through the mother tongue could be rapidly and effectively transferred later to some second language. Thus, for those who are vulnerable to linguistic and cultural "subtraction," the development of skills in the mother tongue deserves top priority until a sound cognitive and linguistic base is established. Once that base is secure, a second language can be added much more safely.

Apart from cognitive value is another factor whose weight could be overshadowed by other considerations in some settings. The second criterion is each language's status value, which refers to the judgmental reactions of listeners and speakers to the alternative language available. These reactions are psychological and social, and they are tied to historical events. Naturally enough, the attitudes and stereotypes associated with a group become attached to the language that group uses. In fact, listeners judge a speaker and ascribe characteristics to him that are consonant with the attitudes they have formed of the ethnolinguistic group the speaker represents. Since in each locale languages have status dimensions that run from high to low, education planners would be well advised to find out how each proposed language of instruction is rated by prospective learners. Fortunately, simple and straightforward techniques for assessing each language's relative status exist. (One example is the "match-guise" procedure developed at McGill University.)

A third criterion in instructional-language selection is the social power of each language under consideration. In this sense, social power refers to the political and socioeconomic class differences that speakers and listeners in a certain locale associate with the use of a language and that limit or enhance the speakers' political or social mobility. Weights can be established relatively easily for this criterion through the use of simple demographic surveys designed to determine which people at which levels of social and political power in the community speak and use which languages and for what purposes. These surveys can be based on interviews with samples of informants at various levels of power in the community and used in conjunction with other indirect assessments to gauge a language's power attributes.

Finally, consideration should also be given to the past/future value of each of the languages involved. This term refers to the historical significance and the future potential of each alternative language in a given context. Assessing this value requires grappling with the vital issues of national unity, social integration, and occupational and educational opportunities. At the same time, it means reckoning with the symbolic significance of the continued use of a "colonial" language (such as English, French, or Dutch) versus the switch to a wider lingua franca (such as Swahili in Africa or Pilipino in the Philippines). It also involves assessing the degree to which a colonial language such as English is "marked" to make it a distinctively

Indian, Filipino, or Nigerian form of English. Through marking, a group can retain the power and status associated with the use of a particular language and still modify its symbolic overtones so young people can enjoy educational and occupational mobility. Although more abstract than the other criteria, the past/future value could also be indexed through sociolinguistic surveys and interviews.

In sum, then, those responsible for choosing languages of instruction must be sensitive to and well informed about the social and psychological values attached to languages. To this end, serious attempts should be made to assess systematically and to assign weights to these four values separately and in combination. In particular, the language-related opinions and beliefs of would-be learners should be surveyed.

Fixed Versus Open-Language Policies

To keep a language policy from becoming obsolete, periodic adjustments or changes may be called for. According to Ansre, for instance, in time more use may be made of indigenous languages for instruction in those African settings where policies presently favor and protect non-indigenous languages. In Ghana, for instance, the use of a more widely accessible lingua franca after the basic primary years may increase, followed by a gradual switch to a world language for more advanced levels of instruction. At any rate, possible changes should be anticipated and accommodated at the start of programs that use indigenous languages for instruction. Where the switch is away from colonial to an indigenous language or to bilingualism, the same principle obtains: gradual shifts and modifications over the range of the school years should be anticipated and reflected in any policy on languages of instruction. A fixed or closed policy would be counterproductive; needed instead is a multi-goal, multi-phase plan that is open and responsive to information, sentiments, and community values.

A Plan for Selecting Languages of Instruction

The general recommendations given here for selecting languages of instruction should be useful to all policymakers, regardless of the setting or languages involved. They place as much emphasis as possible on the use of the mother tongue as the preferred instructional language, especially at the start of educational training. They also call for an assessment of the degrees to which speakers of various mother tongues can understand each other. Equally relevant are the degree to which incoming pupils in any classroom are bilingual or bi-dialectic, and the number of pupils who can clearly understand (if not speak perfectly) an indigenous language if it is used in conjunction with one or more known mother tongues. What is called for, then, is a community-wide survey of language competence, either a formal one conducted by an applied linguist or a less formal one conducted with the assistance of such a specialist.

Understandability, language competence, degree of bilinguality, and other linguistic considerations have to be assessed in conjunction with the equally important psychological and social issues associated with each mother tongue, widely used indigenous language, and world language. Consequently, a

social-psychological assessment of each alternative, conducted along the lines suggested here, should incorporate the value weights assigned to each language, their positive or negative reputations locally and abroad, their political neutrality, their potential for the cognitive development of pupils, and their possible effect on national or regional unity. A survey of this sort is nothing short of fundamental. Using information culled from a survey, educational planners can make a wise choice of language without overshadowing the vital issue of what is to be learned or taught.

Gradually, of course, emphasis can be shifted from exclusively mother-tongue instruction to some form of bilingual instruction using an indigenous language that is shared--through bilingualism or mutual understandability--by a larger number of pupils. For instance, a widely used indigenous language might merit consideration as a second language of instruction over a number of mother tongues because of the pattern of values associated with it. That language could then be introduced as a second language of instruction on an alternate-days basis (as in immersion programs), or it could be taught as a second language (via mother-tongue instruction) in early primary grades.

It follows from this argument that instruction in a wider access language might become an important feature of the primary school program as a supplement to mother-tongue instruction in the early grades. Caution is called for, however, lest the learning of this second language become a tedious time waster in the eyes of learners. If a decision is made to teach a second language, the general intellectual and academic advantages of developing such skills should be made clear to learners.

In contrast to the "three-year" pupils, the fortunate few who can remain in school beyond the elementary years should begin to study some world language (such as English, French, Russian, Chinese, Arabic, etc.) in later elementary school, either in an immersion program (where it is used to teach content) or as a second or third language, taught through a mother tongue or a widely used indigenous language.

Finally, the whole cycle should be seen as experimental, incremental, and open to change. In short, the policies of language usage made today should explicitly include provisions for revision, modification, and change.

The Role of Radio in Language Learning

If it is accepted that learning a second or third language provides important bridges from one stage of education to another, the question becomes how best to facilitate that learning. In this regard, radio's adequacy as a medium through which languages can be learned and as a medium for transmitting innovative basic education programs is an important concern.

With respect to the sensitive language issue, radio is a psychologically expansive medium insofar as it helps learners expatiate upon ideas and spurs the play of imagination. For example, on radio a story of any type--be it a Sherlock Holmes mystery or a simple news report--engages the listener's imagination and power to conceptualize, whereas a video or film presentation of the same story embodies the imagination of a single person--the producer.

In this sense, then, a word is worth a thousand pictures. What's more, in audio form, a story evokes thirty personalized versions for the thirty children in a school classroom. Arguably, the audio-only medium is uniquely capable of inciting imagination, abstraction, and metaphor--making it of great potential value for cognitive development. Peter Kinyanjui contends that radio is an especially powerful medium for education in "verbal societies," such as some in Africa where "oral" traditions are still strong. Perhaps the extension of radio's use would deepen or rekindle these important oral traditions and the abstract modes of thinking they affect.

With regard to radio's effectiveness in teaching second or foreign languages (relative to conventional live teacher-pupil classroom interaction), the evidence surprisingly favors radio. In the Dominican Republic, "radiophonic" students following the Radio Santa Maria format in grades six through eight scored higher than conventionally taught students in all subject matter, including Spanish language and Spanish grammar. Even though more detailed and careful pre-treatment testing of the intellectual and social class backgrounds of the learning groups was needed (because the conventional students were all urban based while the radiophonic groups were largely rural and of "peasant" backgrounds), these results cannot be discounted. As reported by Peter Kinyanjui, a Kenyan experiment in which radio lessons were used to supplement correspondence courses demonstrated that radio was especially helpful in "speech-work" in the two language courses offered--Kiswahili and English--and in the maintenance of good relations between students and the local teachers. As reported by Wilbur Schramm and his colleagues, a controlled 286-school experiment in Thailand involving "radio instruction" groups and otherwise equivalent "no-radio" control groups demonstrated that the radio groups performed significantly above the controls on reading and writing tests, and at the same level on tests of speaking ability. Although additional and more detailed evaluative research on the matter is called for, radio does appear to be a particularly attractive mode for instruction in language arts, whether mother tongue or second or foreign language instruction. In fact, since radio by nature keeps visual inputs and processing at a minimum, it may be uniquely suited to stimulate each learner's ability to process concepts and images--advantageous in language learning.

Using Radio in Language Instruction

In the absence of more extensive research on the effectiveness of radio in education in general and in language instruction in particular, it is difficult to assess the importance of radio *per se* as disctint from, say, that of a new well-planned program or a hand-picked teacher. But existing evidence does suggest that radio can be uniquely effective in the teaching of languages. This established, the following suggestions seem pertinent.

First, teachers must be alert to the learner's attention spans and to the apparent need for active involvement on the part of learners. The emphasis Barbara Searle and her colleagues give to interest limits and active physical responding seems as relevant to instruction in languages as in mathematics. Thus, the units of language instruction need to be vividly imagined, and they must form natural units that can be built upon and integrated. Nor can the importance of a structurally interesting story of complete-unit steps be

overestimated. Further, as language material is presented, the learners should be enticed to listen attentively and then actively respond--for instance, by acting out episodes depicted in radio programs or following simple directions given via radio.

With respect to radio, one especially valuable learning activity is dictation or transcription, which can enrich the learner's listening and production skills in a new language. Whether the students transcribe spoken passages or simply follow the text of what is being read over the radio, this general approach is highly effective.

Radio can also be useful for developing production skills in a new language by eliciting choral responses (in prose or song form) or imitations of the radio model. Similarly, oral responding can be extended to simple question-answer interactions between radio teacher and classroom pupils.

Finally, radio lends itself to the development of those second-language skills that can be picked up incidentally while the focus is placed on content. This is the major idea underlying immersion training, in which learners are taught mathematics and other subjects through the foreign or second language. The pace of presentation is simplified and less rapid at the start, but picks up quickly. Thus, a core math program could be available in various languages, and unit studies in the mother tongue could be replayed and restudied in a new language. More traditional second-language teaching procedures could, of course, also involve radio supplemented by glossary and drill worksheets.

Overall, then, radio is an exciting medium for instruction in a mother tongue as well as in a second or foreign language, and it is useful in more than the development of listening skills. Radio could play the pivotal role in the construction of bridges from mother-tongue instruction to that in widely used indigenous languages.

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CHAPTER VI

WHAT DOES EDUCATIONAL TELEVISION OFFER US NOW?*

Television has been used for educational purposes for at least 35 years. Throughout this period, technical developments have decreased the cost and complexity of production and extended the coverage of the broadcast TV signal to virtually the entire surface of the earth. Nevertheless, the basic form of the medium remains the same, and in general it has produced results that are disappointing when compared to the glowing predictions of its early advocates.

High production costs, coupled with the need for a wide variety of special skills and expensive equipment, have made it difficult for Less Developed Countries (LDCs) and even industrialized countries to expand the use of educational television until it becomes a significant factor in the overall educational system. For almost three decades, various national and international agencies and organizations have supported and encouraged the application of television to education. Yet, many believe that the full potential of the medium is far from realized, so each new technological development is eagerly awaited in the hope that it will be the key needed to unlock television's inherent promise.

Given television's record and promise, it seems perspective-giving to review current video technologies in light of the historic shortcomings of the television medium as it has existed for three decades. Most frequently, three types of limitations are cited--those related to production, those related to distribution, and those related to utilization. Production-related problems have tended to center around the high costs of the capital plant required for effective production, the wide variety of specialized skills needed to operate the equipment and create quality materials, and the expense of meeting production standards set by the need for mass audience programming. Distribution-related problems include the high per capita cost of coverage of low-density rural populations, the channel capacity limitations that prevent the simultaneous use of many channels in one location, and the difficulty associated with aggregating a geographically dispersed population. Utilization-related problems include the "lock step" presentation of materials (which does not allow for the fact that people learn at different rates), the lack of opportunity for learner interaction (so that learning is passive rather than active), and a lack of direct participation of local schoolteachers and extension workers in program production.

These historical limitations of television have reduced its impact on education and its role in the educational system. Yet, recent technical developments make it appropriate to reconsider the role that new television technology should play in education and development.

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* This section of Chapter VI was written by Albert Horley.

New Video Technologies

In recent years, various technical developments have vastly increased the flexibility of television as a medium and, at the same time, reduced the cost and size of equipment. These changes have affected production, distribution, and utilization.

Production. Four major technological innovations have helped to reduce the cost of television production and to enable less highly skilled operators to create and edit video materials. One is the color camera. The technology of video cameras has progressed steadily. The cost has been reduced, the weight and size have been significantly reduced, and several performance aspects have been improved. Today, hand-held cameras that meet or exceed broadcast standards (54.5 dB signal-to-noise ratio) and feature all the controls necessary to handle varying brightness, contrast, and color temperature are available in a single microprocessor control circuit. (Also of note, some research models will operate at light levels as low as 10 lux.) With the application of current state-of-the-art camera technology, color video cameras no larger than Super 8mm movie cameras will be able to deliver the picture quality historically associated with large studio cameras, to operate in very low light, and to be so automated that no special knowledge or skill is required to use them.

The second key innovation is portable VTR. Considerable progress has been made in the art of videotape recording. Portable units small enough to be contained within a hand-held camera have recently been demonstrated, while broadcast quality (47 dB signal-to-noise ratio) has been achieved with a 12-kilogram portable unit that can record thirty minutes of material on one-inch tape.

The third important innovation is the digital time-base corrector, which has made it possible to achieve broadcast standards with inexpensive helical scan recorders. These devices have essentially solved the problems associated with waveform synchronization and timing.

The last major new production technology is computer-based video graphics and switching. Many special editing and production effects can now be accomplished electronically in "real time." The units designed for this purpose make use of low-cost computer memory. They make it possible to introduce sophisticated production and editing techniques without greatly complicating the production process.

Distribution. A second set of technical innovations--the most dramatic and publicly visible of those discussed here--has served to reduce the cost, extend the range, and increase the capacity of video distribution channels. Some of these technologies relate to instantaneous or "real time" channels, while others relate to delayed or stored channels. Key among these technologies are direct broadcast satellite TV, video discs, video cassettes, cable television, and video compression equipment.

The feasibility of using satellites to broadcast programs to remote and widely scattered locations has been demonstrated over the past ten years by technical and operational experiments. The ATS-6 experiments in the U.S. and India, the YURI broadcasting satellite in Japan, and the Canadian ANIK B have all shown the technical and economic feasibility of direct broadcasting by satellite. Today, equipment priced at less than US$500 and capable of receiving satellite television is available, and various operational services are planned. The Japanese and Europeans are in the forefront of developing low-cost receivers for use with the high-powered 12 GHz band, while the U.S. leads in the production of equipment for receiving the weaker signals from 4 GHz domestic satellites. Stations capable of receiving highly viewable TV direct from 4 GHz domestic satellites are available for less than US$5000 from many sources in the U.S.

Within the next five years, satellites will become the dominant video-transmission technology. Already more than 50 channels of satellite television are available in North America. The cost of using this transmission medium continues to fall, and soon many educational groups (especially those that have widely dispersed constituencies) will find it affordable. The cost for occasional-use video transponders on one of the U.S. or Canadian domestic satellites is less than US$400 per hour, and in some special cases less than US$200 per hour.

Now in operation is a network of 128 earth stations associated with U.S. public broadcasting, as well as over 3,000 earth stations at commercial cable headends (program-originating stations). These facilities represent a large and cost-effective means of distributing special purpose educational broadcasting. Similar systems are being developed all around the world. Indonesia has over 100 satellite earth stations capable of receiving television, and many other countries are building similar networks of satellite earth stations. Satellite capacity continues to expand as both domestic and international satellite services are introduced. INTELSAT, the global consortium that provides almost all the satellite circuits between countries, is showing an increasing interest in domestic services. Already, video signals transmitted from INTELSAT IV satellite spot beams are being experimentally received by inexpensive (less than $5000 each) earth stations in Australia.

The use of satellite broadcasting represents one of the most significant advances in video technology. With its wider use, programming can be easily and economically shared around the world. Moreover, since audiences can be aggregated over very wide geographical areas, it becomes economically feasible to broadcast programming for special educational interests. The full impact of this technology will grow over the next decade, as will the variety of direct satellite broadcast services.

Broadcasting via satellite, of course, can reach the remotest spots within a vast coverage area. But the problem is the power source at the receiving end, particularly TV or a videotape recorder. It may be time-consuming to wait for the installation of electric lines. (One solution in the 1980s may be the use of solar energy. The appendix to this chapter explains the viability of this approach.)

A second important new distribution technology is the video disc. Several different models of video disc players have been introduced into the commercial market since 1980. The machines can play back video material that has been recorded on plastic discs that resemble sound phonograph records. (The players are being marketed for US$300 to US$500, while the discs are being sold for about $15 each.)

The video-disc distribution system is ideal for transmitting many educational materials if time is not a critical factor. A potential pitfall, however, is the existence of multiple incompatible technical standards. At least three major contenders have emerged: capacitance electronic discs, optical laser systems, and high density (but no groove) capacitance discs. (It is possible that a single de facto standard will be established by virtue of the quantity and quality of program materials offered using that standard, but so far none has emerged.)

Video disc systems have three features--random access, stop motion, and slow motion capabilities--that makes them attractive for use in sophisticated programmed-learning systems. In some experiments, coupling the microcomputer's elaborate programming and interactive capability with the video disc's random access capability has resulted in effective personalized learning.

Video cassettes are another, though more established, distribution technology. For small-scale local applications, particularly where instant playback is wanted, the video cassette will remain an important technology. Both the price and performance of videotape machines continue to improve. Recorders that cost in the neighborhood of US$500 can record up to six hours of material on a single cassette. Used along with low-cost video cameras, these machines will open many new opportunities for the small-scale local production of educational material by school districts, teachers' colleges, agricultural cooperatives, and health clinics.

Cable television is still another distribution option. In many densely populated areas, coaxial cable systems are being used to distribute television. Part of the appeal of these systems is that they can carry many simultaneous channels of television--typically 20 or 40 channels, and at least 12. This technology has made it possible to get around the limits of the frequency spectrum of broadcast television. Moreover, coaxial cables can carry other types of information, and the access to coaxial cable systems can be controlled. Also worth noting here is the "pay TV" feature of cable, which has made generating revenue for the production of programs possible. Indeed, closed systems such as cable TV are ideally suited for selling educational video materials.

Video compression, another potentially important video technology, is not strictly a transmission technique. Rather, it is a means of increasing the number of video signals a given transmission facility can carry or reducing the transmission channel requirements for a given video signal. Its application is most appreciable when the costs of transmission are great or the available transmission spectrum limited.

Unfortunately, until recently such "bandwidth compression" equipment has been expensive, plagued by performance deficiencies, and incapable of significantly improving transmission through-put. But now, with the increased availability of low-cost semiconductor memory, a series of effective designs has been developed. One of the more sophisticated has been implemented in satellite and microwave transmission systems: transmission bandwidths between 1.5 MHz and 6 MHz are available, and the equipment dynamically allocates information between picture complexity, speed of motion, and frame rate to achieve a pleasing picture under a wide variety of changing circumstances. Other new features (such as slow scan, stop action, and velocity scanning) also afford significant channel cost savings. Ten-to-one bandwidth reductions are theoretically possible, and three-to-one reductions are practical and economic with today's technology. Thus, the costs of long-distance video transmission can be reduced by a factor of two to five.

Utilization. The interaction among the media, the student, and the support system is central to the success of any educational use of television. Yet, too little attention has been paid to the role that technology might play in enhancing this interaction. In particular, the multi-channel and interactive features of some of the new communications technologies need to be examined in this light.

Interactive (or two-way) cable is a technology based on the bi-directional transmission properties of coaxial cable. Several two-way cable systems have been experimentally implemented in the U.S. under the name QUBE. These systems make it possible for viewers and the program source to interact, largely via the selection of pre-programmed alternatives. Each learner can pursue his study at his own pace after he is confident that he has completed each step of the lesson cycle.

The latest teletext systems, another utilization technology, permit the transmission of text and limited graphics during the vertical blanking interval of the television signal. This information goes into memory storage incorporated in the television set and can be displayed on command. To date, this system--with which it is possible to present the text frames either superimposed on the picture (as subtitles) or entirely separately--has been viewed as a means of providing additional services (weather, reports, quotations of stock prices, etc.) over the same channel as television. But with innovative program development, it could also provide utilization support (such as multiple-answer responses for questions asked in the TV program). Indeed, the cost of both the text preparation and its transmission is far less than that associated with the TV program itself, partly because the computer memory costs little. The enthusiasm with which several prototype systems have been greeted indicates that this technology will soon be a serious alternative for educational systems.

Less sophisticated than teletext systems, still-picture television is adequate and effective for many educational and informational purposes. The advantage of such systems is that they can transmit a large nubmer of programs over a single television channel. In addition, production costs are considerably lower than those of full-motion video.

One still-picture system was utilized in satellite experimental transmissions with the ATS-6 broadcasting satellite in 1974. More recently, the Japan Broadcasting Corporation research laboratory has demonstrated a 50-channel system that works with a conventional television receiver. The still pictures for any one program are transmitted at the rate of one frame period for every 50 frames with an interval of 5 to 10 seconds between pictures. A control code is added to each picture, and the sound is digitally encoded and multiplexed with the other 49 channels. An adaptor attached to the home television set captures and holds the frame of interest.

Cost reductions by a factor of over one hundred in the area of solid-state memory have made still-picture technology economically feasible, so most likely more applications will emerge in the near future.

The microcomputer is a third utilization technology whose use will help shape the future of educational television. While microcomputers are not, strictly speaking, a part of educational television, their use in the home has been closely tied to the availability of television receivers to display the computer output. More recently, once-inaccessible data bases have become part of the home computer scene. Most likely, the significant information-carrying capacity of television will be used to supply programs and data to small computers. (Both the vertical interval and multiple-audio subcarriers are logical candidates for data transmission within the conventional television signal.) Overall, the combination of television and computer would appear to be a most powerful educational tool, though the complexity of programming such a hybrid medium will require substantial initial investment.

Conclusions

Many recent technical developments are both reducing television's cost and increasing the capability of television to deal effectively with educational challenges and problems. The time is ripe to re-examine the historic approaches to educational television and to explore not only new methods but new media, such as the hybrid computer/television systems. One of the most encouraging aspects of these new systems is the ease of access they afford to the program production process. Such systems hold the promise of accommodating a combination of high-quality video program material and data bases that feature relevant, locally produced material. They also give students the opportunity to respond to that material.

While some of these technologies may seem like science fiction to many educators, technical change can occur quickly. Video cassettes are already in widespread use. Direct broadcasting satellites will be commonplace in five years, as will home computers. Video disc systems will also find quick acceptance because of their entertainment value.

The key to expanding educational television is almost certainly the new electronic entertainment and information technologies, the sales of which will provide the economic basis for the growth and dissemination of the equipment. At the same time, a greater opportunity for and emphasis upon user interaction with the media will characterize these developments, though making the most of this potential will require devoting more attention to helping great numbers of people develop simple programming skills.

In short, educational television is on the threshold of becoming a decentralized medium, one more under the control of its users than its creators. This means that both the ability to plan its future and the responsibility for its use will become less the concerns of the specialist and more those of the average educator.

APPENDIX TO CHAPTER VI

PHOTOVOLTAIC POWER FOR COMMUNICATION *

Sunlight can be converted directly into useful energy in two ways. Incident sunlight can be converted directly into heat by photothermal conversion, using a device that selectively absorbs the sun's rays. (A greenhouse is a simple form of this device.) Or, incident sunlight can be converted directly into electricity by photovoltaic conversion, using a solar cell that utilizes the photoelectronic properties of a semiconductor.

Each solar cell can supply up to one-half volt of current. At lower voltages, the current supplied is nearly independent of voltage, but varies with light intensity. About 160mA can be obtained from each square inch of surface exposed to bright sunlight. (This would amount to over 1.5 amps from a 3.5-inch diameter cell.) The maximum power deliverable to an external load is typically 11 percent to 12 percent of the total solar energy incident on the cell, though over 15 percent has been delivered in laboratory models. To obtain higher voltages, cells are connected in series, as they are when packaged in the modules that become the building blocks for arrays designed to meet a customer's specific needs.

What Are the Components of a Solar System?

The total energy received from the sun in one year at any specific location of the earth is amazingly constant: from year to year, the variation is less than 10 percent. However, seasonal and daily variations can be large and unpredictable. To avoid power outages at night and during inclement weather, some means of storing the energy generated on sunny days must therefore be employed. All photovoltaic generator systems in use today employ rechargeable electric storage batteries for this purpose, and standard solar

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* This section was written by Gerald Hein.

cell modules are designed to provide the current and voltage to charge these batteries efficiently. The storage battery acts as a buffer between the solar array and the load, supplying power to the load during periods of low sunlight (and no sun) and accepting charge from the array during periods of high sunlight. Although the state of charge may vary seasonally as well as daily (so that the average sunshine during the winter may be insufficient to supply the load), any wintertime insufficiency will be made up by excess sunshine during the summer.

Besides a properly sized solar cell array and storage battery, a complete solar electric generator system includes a blocking diode that prevents the battery current from draining through the solar cell array at night. The blocking diode between the solar array and the battery allows current to flow from the array to the battery, but not from the battery to the array.

In a complete array and storage system, a voltage regulator may also be included so as to avoid overcharging the battery, and thus losing electrolytes. Overcharging occurs when the battery is fully charged and the solar array continues to supply more power than the load demands. The voltage regulator works by shunting the excess current through a dummy load under these conditions.

The two controlling factors in the design of photovoltaic power systems are the amount of solar radiation received and the daily energy demand. Selecting the raw insolation data on which to base the design of a solar array system also requires assessing and noting the differences between the meteorological conditions prevailing at the data station and those at the system location. (Other factors to be taken into account are the units in which the sunlight data is expressed, the source of the data, the various types of detecting instruments used, and the period over which the data were accumulated.) Most proposed solar array installations are located away from populated areas, while most of the solar radiation recording stations are in populous locations. This fact is critical since a distance of a few hundred miles between recording stations and installation locations can translate into significant differences in prevailing sunlight conditions. Moreover, factors such as terrain differences (including the presence of mountains, deserts, heavily vegetated regions, or large bodies of water), elevation differences, and physical distances must also be weighted for each location.

Data on sunlight is available in many different forms. Weather services generally report the percentage of possible sunshine actually received day to day and the number of hours of sunshine received. But while these data have their uses, they are not normally adequate for use in the design of a solar electric generator, which requires a knowledge of the total energy received. (Approximate data could be obtained by making some assumptions about weather and sky conditions, but they would be much less reliable than data recorded on site.) Overall, *monthly and yearly averages are most adaptable to* use in systems design since the sunlight is a day-to-day variable.

What Are the Costs of Communications Applications of Solar Cells?

At today's costs, the economic applications of solar energy are almost exclusively remote power applications such as microwave stations, off-shore navigational aids, railroad crossing signals, and other applications that require reliable electrical power in locations that personnel or commercial power lines cannot readily reach.

The use of photovoltaics for communications equipment is the largest single use of the technology at the present time. Indeed, even as the technology becomes more widely used for other applications it will remain ideally suited for supplying power for receivers, transmitters, and communication relay equipment. Some examples illustrate the sizing required and the costs (exclusive of import duties and shipping costs) that might be incurred in the use of photovoltaics.

The exemplary sites--Jakarta, Indonesia; Bogota, Colombia; and Fort Lamy, Chad--all have very good sunlight conditions, with Chad being the best of the three. According to the World Distribution of Solar Radiation, the average daily sunlight for each location is as follows:

Jakarta	394 Langleys per day*
Bogota	403 Langleys per day
Fort Lamy	558 Langleys per day

If a 12-volt, 20-watt television receiver is used as the basis of comparison, the set might require power that is suitable for five to ten hours of operation daily or 0.10 to 0.20 kilowatt-hours of energy daily. For this application, a motor generator set would not be suitable, so the valid comparison is between primary batteries and photovoltaics. Using a primary battery would require a battery pack, wiring to the television receiver, and the television receiver itself. Using photovoltaics would require a photovoltaic array, a secondary or rechargeable battery, a voltage regulator, wiring to the television receiver, and the television receiver itself.

The television receiver costs roughly US$150, while wiring costs are incidental. The primary battery would cost about US$300 or more for 12 kilowatt-hour cells, which would last approximately three months if the receiver were used six hours per day. The annual cost of the primary battery power supply would be about US$1200 in the three locations in the sampling.

Using the photovoltaic power supply for the same television receiver for six hours of operation daily would require one photovoltaic module nominally rated at about 33 peak watts of output in full sunlight, a small voltage regulator, one lead-acid battery of the type used in automobiles, and wiring to the receiver. The total cost of this power supply would vary from about US$600 to US$850, depending upon the quantity purchased and dealer's profit.

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* A Langley equals one gram calorie per square centimeter.

The photovoltaic power system can be expected to last ten to twenty years and the lead-acid battery five years. Assuming only a five-year life and an annual capital recovery or interest rate of 15 percent, the annualized cost of the photovoltaic system would be US$174 to US$247, compared to the US$1200 for the primary-battery power supply.

The photovoltaic system will be at least as reliable as the primary-battery system, and it will require little maintenance other than occasionally washing the components and checking battery water levels. The photovoltaic power supply will easily provide six hours of daily service in Jakarta and Bogota and eight hours in Fort Lamy.

Power for transmitters and satellite terminals can also be supplied by photovoltaic systems, the size of which is determined by the power requirements of the transmitter or the satellite terminal. For very small satellite-receiving terminals that would receive broadcasts from relatively high-powered satellites (such as ATS-6 or the Canadian Technology Satellite), the receiving station would require only one or two photovoltaic modules. (This small system would be very similar to the power supply set-up required for the television receiver discussed previously, except that two-way audio could be added, with the annual cost for the power supply using two photovoltaic modules ranging around US$200 more per year.)

Larger satellite stations or transmitters require photovoltaic systems consisting of 200 or more photovoltaic modules. Photovoltaic systems of such a size are in use today for communications systems around the world, and they are proving very reliable. This rule of thumb notwithstanding, it is difficult to anticipate the actual power requirements for any site. In general, photovoltaic systems are sized to meet given requirements.

To provide local broadcasts to television receivers, a microwave receiving station and local transmitter may operate at 24 volts with about 5 kilowatts of input power. This receiving and broadcast station could operate as a satellite re-broadcast station, or it could receive a terrestrial signal for local broadcasting. If the broadcast station were to operate in Bogota, Jakarta, or Fort Lamy for approximately six hours per day, about 6 kilowatt-hours of energy at 24 volts would be needed. The photovoltaic power supply would consist of approximately 180 photovoltaic modules, a voltage regulator, and a lead-acid storage bank capable of lasting through several sunless days in Jakarta and Bogota. (Fort Lamy would require only about 125 photovoltaic modules because the solar radiation is much higher there.) For Jakarta and Bogota systems, the 180-module system may cost in the range of US$150,000, and for the Fort Lamy 125-module system the cost may be about US$105,000. Such a system could easily be expected to last ten to twenty years since a communication facility has skilled maintenance people and technicians on the premises. With a 10-year life and an annual capital recovery or interest rate of 15 percent, the annualized cost of the larger photovoltaic system would be about US$30,000 and the smaller system's annualized cost would be about US$21,000.

A dual diesel 10KVA generator used to supply power for the receiver-transmitter station would cost approximately US$14,000 installed and could be expected to last for several years except in a dusty or sandy environment. Maintenance and fuel costs are often assumed to be minimal, but experience shows that the annual costs for these items may be US$10,000 to US$20,000 in remote or rugged environments. Assuming a five-year life and a 15 percent capital recovery rate, the diesel generator could be expected to cost US$12,000 to US$22,000 on an annualized basis.

Obviously, the photovoltaic system is not at this time the first economic choice for the transmitter, but more and more installers and operators of large communication relay systems are turning to photovoltaics. Their reasons are many: photovoltaics are highly reliable, diesel generators are hard to maintain in a sandy environment, and obtaining diesel fuel is becoming ever more expensive and difficult. As oil prices increase and photovoltaic costs continue to decrease, photovoltaic power systems will become increasingly economical for powering larger communication broadcast facilities in remote areas.

CHAPTER VII

SELECTING APPROPRIATE MEDIA *

The Industrial Revolution increased the power of man's muscles. The Communications Revolution multiplies the power of his brain.

Educational systems, instructional systems and training systems are involved in this revolution because they are communication systems. Instruction can be vastly more effective and efficient with the new media, but what is taught and how it is taught will change.

It is not simply a question of being taught through the new technology of the Communications Revolution, but of being given the means to participate in the Revolution. It is not a matter of putting a radio or television receiver in a classroom, but of changing the whole process of instruction.

We know that technology solves one set of problems only to give rise to another. We know that it is a two-edged sword that, badly handled, can do more harm than good. However, the whole idea of "more developed" and "less developed" countries is that some countries are more technologically developed and some are less technologically developed. The better conditions in the industrialized countries are basically due to technological advances. This suggests that in order to improve education in LDCs we should look for a technological solution, rather than continue to commit ourselves to the non-technological solutions that have not answered basic educational needs. The question, then, is one of which technology to adopt, and how.

Conventional Forms of Instruction

The three universal types of instruction are on-the-job training, classroom teaching, and informal learning.

On-the-Job Training. The oldest, and perhaps most pervasive, learning process is on-the-job training. People learn to ride, fence, swim, type, cook, plough, drive a car, by physically doing these things. They can, of course, learn for themselves, but to take advantage of what is already known about a skill--the tricks of the trade--they need an instructor to give advice, examples, and feedback. We see this with a mother teaching her daughter housework, apprentices learning the skills of plumbing, or interns learning to be doctors.

Trainees usually want to have to learn a skill and the training process usually goes on until they have. Conventional training is not, however, a very efficient form of instruction in terms of the numbers that can be taught by an instructor. A sargeant can make his voice or gestures carry over some 30 or 40 rookies to teach some elements of drill, but most on-the-job training is

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* This chapter was written by John Tiffin.

done with a much lower ratio of instructor to trainees. The trainees need to be able to hear the instructor and see what he and they are doing. As countries develop and expand, the need for training large numbers becomes critical. Conventional "on-the-job-training" becomes inadequate.

There is another problem. The results of inadequate training are getting more severe as the new technologies put more power in the hands of the employee. The possibilities for disaster caused by a poorly trained assistant in a conventional shop are limited, those the operator of a computer terminal at a supermarket check-out stand could cause are obviously much greater. A street cleaner with a broom can usually do little damage, but the possibilities are much greater when he has a street-cleaning machine. As technology becomes more complex, the consequences of mistakes become greater and there is more need for a practice stage before the trainee actually does the job.

Classroom Teaching. For most of the people of the world "real" instruction, "real" education, "real" training is what goes on in a classroom. The classroom has always been a symbol for the aspirations of those who seek to improve their lot by gaining access to the accreted knowledge contained in books.

More and more we see information as power. There is a direct correlation between education and development, and LDCs see their lack of development in terms of a lack of education for the majority of their people. The classroom is still seen as the answer, and its use continues to spread across the world.

The classroom is the world's first deliberately designed instructional system. It is a venerated symbol, a hallowed institution, but there are many signs that it is no longer suited to society's needs. The feeling grows that classroom teaching is ineffective.

The Communications Revolution has seen an explosion not only in the capacity of media to transmit messages but also in the quantity of information. The available information continues to grow exponentially: it is now impossible for any individual to conceive of mastering a significant area of knowledge. Although students still need the basic skills of alphanumeracy and the pedestal concepts of subjects they wish to study, increasingly they need to learn how to "access" and use information rather than remember it. They need access to far more information than what the teacher can remember.

The role of a teacher as "donor da verdade" is psychologically a heady one. If information is power, then in his traditional role the teacher dispensed it. Teachers have demonstrated great reluctance to abandon this role and to allow students access to information that is not teacher-controllable. "We don't use the ETV programs because they show the students things we don't know."

In many Less Developed Countries (LDC's) only a minority of those who enter a school system complete their schooling, and a large number of those who are in a class at any given time are repeaters. Anyone with experience in schools in LDCs knows that--though there are some dedicated teachers with

natural talent who would be outstanding in any society, and some schools holding to high standards of teaching--what often passes for teaching, especially at the primary level, is most inadequate, even when the teacher is present.

A school system consumes a significant proportion of any country's resources. First, it requires a ratio of one teacher to thirty or forty students. Second, the schools are dispersed all over the country. Third, an extensive administrative infrastructure is needed. In the current energy crisis, can LDCs afford conventional classroom teaching?

Informal Learning. The third basic learning process is informal learning. Like on-the-job training, it is universal and pervasive. It includes the daily process of adding concepts to our picture of the world about us--the getting of news and information without which our mental structures would be static. It includes updating professional knowledge or special interests--the process a self-motivated autonomous learner indulges in when he teaches himself something or learns something for the sake of learning. To LDCs, processes of informal learning are ways to teach people to improve their standards of living, health, and nutrition, to transmit a cultural heritage, and to develop a sense of national identity.

Although informal learning would includes learning from a "teach yourself" programmed text, basically it is not a very structured learning process. It relies on the internal strategies of the learner. There is no teacher or instructor to act as a gatekeeper in the communication process. So it is here, in the area of informal learning, that we find mass media in the form of books, newspapers, radio, and television as the principal sources of instruction.

Books, of course, have always been the medium for the more serious forms of informal learning, and the provision of public libraries has been seen as virtually a primary right for the citizen, allowing him access to the body of literature in his language and providing him with a basic tool for self-improvement and intellectual growth.

Radio is the great medium of informal education in the LDCs, though television is rapidly catching up to it. As previous chapters noted, television and radio appear well suited in themselves to the informal learning needs of LDCs. However, The McBride Commission Report has highlighted a number of problems in the forms that media have taken in the LDCs. In particular, although more and more people can receive messages by mass media, fewer and fewer can create them, and the growth in production costs means that the messages tend to be made in rich, industrialized countries.

The McBride Commission Report is concerned that radio and television are becoming choked with garbage to the detriment of the free flow of information that would lead to meaningful informal learning. This is not to say that people do not learn from low-quality programming. In Ghana, a survey of viewing habits for television showed that the commercials were very popular and regarded as extremely instructional. They told you about new products that improved the quality of life. The dilemma is that wherever there are teachers or instructors in a conventional role, they block radio and television. When

the door is opened to mass media, commercial priorities tend to become dominant, and learning is distorted.

The Media of the Communications Revolution

Mass media in common parlance is accepted to mean broadcast television, radio, film, and print. They have in common their ability to reach huge audiences. Previous chapters have also looked at other media such as filmstrips, audiocassettes, overhead projectors, and so on--what Schramm calls "little media," as distinct from "big media."

The "little media" are often referred to as "teaching aids." They have been adopted by classroom teachers because they represent a direct extension of the teacher's ability to communicate. Basically, they are media by which the classroom teacher can communicate, as distinct from radio and television, through which other people communicate with the teacher's class. As explained in Chapter I, the use of "little media" improves and enriches classroom teaching, though it also adds to the costs.

Of the "big media," film showed great promise, but the administrative infrastructure needed to distribute the films has been difficult to maintain. The teacher, daunted by the need to move and install the projector and black out the classroom, has never really made much use of this medium. Although the problem of the difficulty of threading film has been largely solved with film cassettes and self-loading devices, the basic technologies of film change little. Production costs are high, projection equipment is expensive, and the price of film will grow with the pressure on the supply of silver. The prospects for great expansion of the use of film in the classroom do not seem great.

Books are the one mass medium that has been accepted in all forms of learning. The mushrooming mass of information is largely contained in written language and stored in books. The printed word, especially in book form, is respected as a source of knowledge even more than the teacher. Yet, much of printed knowledge grows by self feeding. The greater the number of references, the longer the bibliography, the more respected is the erudition of the writer, and the more highly regarded his material. Yet, as any researcher knows, following up the references frequently leads to other references or to statements whose basis is obscure.

The growth of printed information can take us farther and farther from the reality on which it is based. We grow so involved with verbal concepts that we totally lose sight of what they refer to. The classroom teacher derives his knowledge from print and teaches his students how to use and respect the written sign system. But what is taught in the world's classrooms is often remote from the real world. This is especially true of LDCs, where much printed material is from the developed countries and refers to matters far from the student's reality.

The world's forests diminish yearly, and as they do, the price of pulp goes up. The whole process of cutting the trees, transporting the pulp and timber, printing, and distribution, is energy consuming. Production of books is increasing, but so is their cost.

The trend can be counterbalanced where LDCs have their own paper mills and develop their own printing and publishing systems. The technology of printing has recently been linked to computer technology so that the process is much simpler and cheaper, and small runs of text can be viable.

The Electronic Media. Books and films, along with the "little media," are relatively stable media technologies that have found their place in conventional instruction. They are unlikely to provoke dramatic changes. They are not the media of the Communications Revolution.

Electronic media are volatile. Unlike the technology of the blackboard or the slide projector, they are constantly changing and developing, and in their development they can defy classifications that formerly seemed secure.

When they were first introduced into education, radio and television seemed monolithic and independent. But electronics develop. The advent of the tape recorder, and in particular of the small, economical cassette recorder, began to convert radio from a big medium to a little medium. A teacher could record the programs he wanted, select what he wanted, and present the material to his pupils when he wanted, in a context that he controlled. Television is beginning to follow the same path as the videotape recorder changes, that from a most expensive piece of equipment to a small machine. Videocassettes and video discs take the process farther. Computers are in the forefront of the miniaturization process. Fascinatingly, as the electronic media develop, there is less and less difference between them. The same disc can reproduce audio, moving, and still pictures.

Films and photographs, books and posters can all be encoded as electronic impulses. The computer can organize and catalog, search and "access" this electronic information. It can analyze and correlate the data, edit and extrapolate, deduce and induce from it. It is this quite extraordinary capacity and versatility that is important--not the aspects of it that first appeared in isolated technologies in the form of broadcast television, radio, and telephonic communication.

The key to electronic media is the computer, not radio or television. The computer is to electronic media what the teacher is to the classroom. It controls the sequence of events and guides the learner through the different activities in different media.

"Computer"--like the other jargonistic expressions for electronic media such as video and television--is a highly emotive word, calling to mind large mysterious, expensive machines. Yet, already it can refer to a relatively small, inexpensive device.

This chapter was written on a computer. It is the size of a typewriter, and it costs about US$1000. It is linked to a conventional television receiver, which shows me what I am writing. The receiver is cheaper than the computer, but that is only because it is produced on a far greater scale than the computer. The television receiver has far more parts, is far more complicated, and far more likely to break down than the computer. If the computer were manufactured on the scale of the television receiver, it would be cheaper than the receiver. This small computer has an awesome capacity to access information, to manipulate information, and to create information. It can be linked by telephone to another computer, and it can use the information in that computer. It can send this chapter to another computer in any part of the world. There is no need to use a cumbersome, slow, energy-consuming postal system.

This computer is programmed to be a word processor. This means that it can add or delete, change things around, and make notes--do things that no ordinary typewriter can. It could be programmed to be an accountant, a navigator, or a librarian. It is not difficult to program it to be a teacher.

This computer has the capacity that 20 years ago went with a $1,000,000 computer that occupied a special air-conditioned room. It is already obsolete. In five years, a computer the size of a pocket calculator will have far more capacity and be far cheaper. In five years' time, it should be possible for a student to have a tiny electric teacher for little more than what will then be the price of a textbook. Meanwhile, we are building classrooms and training teachers in the conventional mode to last for the next fifty years.

Electronic media are getting cheaper, and the signs are that they will continue to do so. They do use energy, but their energy requirements, always quite small, are diminishing rapidly. The amount of energy used to send a letter electronically is a tiny fraction of that needed to send it by post. The basic raw material is silicon, of which there is no conceivable shortage. The big costs in electronic media are those of development, so that the more the media are adopted, the cheaper they get. New "solid sate" techniques are increasing the electronic media's reliability and ability to withstand hostile environments.

Radio is certainly cheaper than television, and will remain so. As a number of the chapters in this volume point out, radio can be superior to television in certain kinds of teaching.

There has been a lot of research comparing radio and television, but most of this evaluates retention of verbal facts and concepts by means of written tests and questions. When pupils are questioned in testing with pictures and have to identify visual aspects of a program, those who have not seen pictures fail totally. If the teaching objectives involve abstract ideas, concepts, and imaginative activities, then pictures can be distractions. However, if a teaching task involves concrete data that have a visual aspect related to practical skills, then students do not learn as well with their eyes closed. (Furthermore, abstractions can often be made more comprehensive with graphic symbolization.)

"Accountability" has led to a fashion of comparing the costs of different media. However, the difficulty is that usually we are not comparing like with like. There are very wide variations in the cost of any particular medium. A mass-produced textbook may be produced at US$2 per copy, which, on the basis of a life of 50 hours, works out at a rate of 4 cents per hour per student. A university text may cost as much as US$80.00, or US$1.60 per student hour--forty times as much.

Sesame Street provided the cheapest instructional television in the world. The cost per student per program has been estimated at 4 cents. Even including depreciation of the receiver, this may total under 10 cents per hour per pupil. Yet, there are instructional television programs produced for such small audiences (20 to 30 viewers for some Open University productions) that it would have been cheaper to chauffeur each student individually to a good hotel, give him supper, and then tutor him individually.

Radio instruction shows a similarly wide range of cost, running on average one tenth the cost of television.

An hour's use of a microcomputer in the U.S. can cost around 10 cents; and a system that uses sophisticated terminals coupled to a mini computer can produce instruction at about 25 cents per hour per terminal.

A university lecturer may cost US$100.00 per hour when teaching 20 students, a per capita cost of $5 per hour. A rural teacher may be lucky to receive $100 per month for teaching 50 children for 6 hours a day-a per capita rate of 2 cents per hour, though this figure would be doubled by adding administrative costs.

Comparing the costs per hour per student does not take into consideration the qualitative differences of the instruction. There is a qualitative difference between the interactive teaching of a microcomputer giving its undivided "attention" to a student and a poorly trained teacher having to divide his attention among 50 students. The same teacher, restricted to the confines of his classroom, cannot provide the vivid simulation of geographical phenomena that can be given by a good television program.

Quantitatively, the per capita costs for teachers, texts, and radio are currently lower than those for television and computers. In LDCs, teachers are paid much less than in industrialized countries. Television and microcomputers cost more in LDCs because of tariff barriers and maintenance costs.

Each individual medium has its own special restrictions. Broadcast television or radio cannot be paced to suit the individual as a text of a mirocomputer can. A single teacher in a classroom cannot reach the millions of people that a radio program can. Because of this, most instructional systems use a combination of media. The traditional media combination in schools is chalk, talk, and text. This is the cheapest possible combination of media in LDCs, and its use creates a conservative attitude toward new media. In industrialized countries, where teachers are highly paid and electronic media are cheaper, there is an economic impulse toward the adoption of new media.

This is the situation at the moment. All indications are that teachers and textbooks will become increasingly expensive in the future, and that electronic media will become steadily cheaper.

Electronic Media and the Three Basic Modes of Learning

On-the-Job-Training. The fundamental processes of this training are watching the job being done, attempting to do the job, and receiving feedback that improves performance. The more technical the job, the more it is linked with some form of classroom teaching that provides a theoretical framework or mental structure for the task.

Watching the job being done in conventional training means that there must be someone present who is skillful in it. Only the people present who can observe the skilled person carefully can learn at one time. The numbers who can watch a surgeon or a car mechanic at work are limited.

Increasingly, video, TV and video-recording devices are providing the answer. In this area, their value has been convincingly demonstrated and their use is increasing. Medical training has been a leader in the use of video. Management and industrial training are making more and more use of video equipment. Video can also be used for modelling the learner's performance, as Chapter III describes in the section on microteaching.

The more that jobs become technological, the greater the consequences of a mistake. Hence, on-the-job training increasingly makes use of simulation. This is where the computer comes into its own. Not only can it handle large numbers of variables and project the consequences of using them, but it can also be linked to video and audio display units and to simulation devices.

Classroom Teaching. This, the area of greatest perceived need, was where the highest hopes were held for radio and television. Twenty years ago, they were regarded as the panacea for the problems of formal and nonformal classroom teaching. LDCs clamored for them, and projects were set up and systems started in a wide variety of countries. But many have collapsed, others stagger from crisis to crisis, and researchers have even asked whether or not the audio visual media can teach.

Most of the early radio and television projects simply placed a receiver in the classroom and broadcast programs to supplement or enrich conventional teaching. In many LDCs, there was another motive--to improve the quality of the teaching.

Because the decisions to implant educational television or radio were often of a political nature and involved considerable expense, there was a tendency for these ventures to be showpieces and to be self-justifying. They have, however, had little real success wherever the traditional concept of a teacher has existed. Traditional teachers are the rule, not the exception, and it is only in the primary schools in such countries as Japan and Britain where the teachers are strongly "learning oriented" that broadcast radio and television have been widely used.

One basic reason appears to be that there is an ego conflict between the teacher in the classroom and the television producer. Difficulties in harmonizing the timetable and curriculum, and the unreliability of the technology in its initial stages are further problems. In the case of television, there has been a further conflict. What is taught and tested in the classrooms is based on alphanumeric symbols. The main purpose and point of television was, in theory, to provide a representation of the reality on which the symbols were based.

The development of cassettes has resolved the timetable problem, and teachers in LDCs are increasingly using video and audio cassette technology. Videocassettes as a training aid are, however, expensive, and as an add-on it is still difficult to see them being adopted in LDCs to any great extent.

A number of mass television projects have spearheaded curriculum reform, and in this they appear to have been successful. In El Salvador and American Samoa, there have been dramatic improvements in the quality of teaching in schools as a result of the intervention of television. However, there appears to come a point when the television system is no longer a major force and when the need for it is called into question. These television projects have involved massive financial outlays, and they raise the question of whether such an expensive method of provoking curriculum reform is necessary. The Radio Mathematics project in Nicaragua suggests that if the goal is reform of an existing educational system, radio might be equally effective and less costly.

The most successful television projects appear to be those in which television has replaced the teacher as the source of information. The television schools of Niger, Mexico, and Northern Brazil have been introduced in situations where there was no existing educational infrastructure. Consequently, teachers have sought a solution with television and workbooks. There is an adult in each class, but he is not expected to know the content of the lessons. He manages the class, and he is taught some rudiments of technique so that he can help the students learn from the television and from workbooks. These schemes are more genuinely innovative, and at times offer quite startling perspectives of what the future in education could be like.

In the state of Ceara, in Brazil, is one of the most outstandingly successful ETV systems in the world. It is quite different from any other. It is an indigenous adaptation of modern educational media and educational methods to the needs of a desperately poor part of Brazil:

> In a telescola, a lesson begins with a 15-minute TV program. It is part of a series about the adventures of a football team of youngsters of the same age as the class. The students follow it avidly. When it finishes, they break into groups of four. They know that they have to master certain rules of grammar and mathematics, and they try these out in terms of the program. The football teams were trying to work out how to buy some shirts. A store offers a percentage discount if they buy a dozen, but they only need eleven. They make sure that everyone in their group understands the principles and then devise tests for the other groups to make sure that

they too understand. They are extraordinarily adroit at this, and deeply involved in the issue. The whole class has to understand, and if an individual still can't grasp percentages, then his group will work with him after school. (If the problem is that he is missing school because he has to work, they will go and help him so that he can catch up).

Inter-group work finishes and there is another television broadcast. This time it is a television teacher explaining the next task, showing the students what to do in their workbooks and what to read and going over some common difficulties from the previous task that showed up in the station's evaluation.

The program finishes, corrected workbooks are passed out and the students work on them as individuals, trying to master the objectives in readiness for tomorrow's broadcast.

The teacher? There isn't one. An "orientador de aprendizagem" sat at the back of the class and marked workbooks, but otherwise took no part.

It is important to place the early projects in the use of ETV in the classroom in perspective. They are pioneer attempts. It is normal for many of the pioneer attempts in a new technology to fail. It is also important to recognize that the full tide of the Communications Revolution is not yet upon us. Radio and television were the first tentacles of electronic media. The body of the beast in the shape of the computer is only just beginning to appear.

What will happen when most of the interactive teaching functions in most of the basic areas of study can be carried out by a microcomputer the size of a pocket calculator at a fraction of the cost of a teacher, however badly paid? Individual instruction for everyone? No more repeaters? Will a student be able to leave school for family reasons and then at another time or in another place return without problems? Will there be classes? If so, what will they be for? Socializing activities, drama, games?

What will happen as the extraordinary development of transmission capability begins to reach the remotest schools so that by cable or satellite they are linked to vast storehouses of information?

Informal learning. The McBride Commission Report has highlighted the way mass media as currently used make LDCs the receivers of media messages with little say in the origination of messages. It has also described the way that attempts to use mass media for informal learning and the development of national and cultural identity are inhibited by the commercial exploitation of mass media.

As electronic media develop, the situation is likely to change for the following reasons. In the early days of television, getting together large studios full of extremely complex equipment attended by teams of specialists was the only way to assemble a program. A studio is no longer essential--only

an editing room. Equipment for an outside broadcast can go into the back of a car and be carried by one man. Two of three people are all that are needed, and even one-man operations are not a rarity.

Creating an artificial world of drama continues to increase in cost, but taking television to the people is getting very much cheaper.

This is also true of radio. Community broadcasting to small groups of people, as described in Chapter II, is becoming an increasingly viable alternative to big network broadcasting in LDCs.

In the early days of the computer, it was an enormous machine with highly paid attendants, who were rare creatures. Programming was only for the initiated few, a mystery of mysteries. Very large computers still exist. Their power is even greater--but so is their accessibility. They will soon be available to anyone with a telephone.

At the other end of the spectrum, the microcomputer is putting computing power into the hands of everyone. In industrialized countries, it is becoming routine to have schoolchildren learn to access and use computers. They are the first "computerate" generation, and their parents struggle to keep up.

It will be a long time before every LDC family has a telephone or a television, but most of the villages have at least one telephone. Is it unreasonable to think of a "village learning center" where there is some kind of terminal linked to the telephone? The terminal would enable people to access information from the data banks of a central computer or to learn from the village microcomputer.

What emerges from all this is that we are sufficiently into the Communications Revolution to perceive the limitations and inadequacies of conventional instructional communication, the need for change, and the possibilities that the new technologies offer. However, we are not sufficiently into the Revolution to be able to recognize the form that it will take and the future shape of instruction. What is important for each country and especially for LDCs is to have some say as to what shape the future will take.

The Need for Research and Development

Perhaps it is a legacy of colonial times when cultural patterns were imposed on colonies, but industrialized countries tend to transplant systems rather than the principles upon which the systems are based. It must also be admitted that the project mentality and the reasonable worries of any organization investing in LDCs also contribute to the process of setting up systems rather than providing the principles. The system is known to work, and the assumption is that consultants, advisors, or technicians can adapt it, or adapt the surroundings and the people in an LDC so that it can be made to work again. Simply to explain the principle and wait and see what happens appears a much more risky alternative with far less chance of success. It must also be recognized that LDCs themselves appear to want to buy systems "off the shelf." They see a technology working in an industrialized country, and ask

why it cannot work for them. The problem lies in the application of the technology: a system developed for use in a high-technology society is unlikely to be suited to a low-technology society. The principles need to be reapplied. It is not that the "barefoot doctors" do not use modern medical technology--it is the way they apply medical technology to the conditions and needs of their own country that makes the difference.

It is possible to make a quantum leap in technology given the principles of the technology and the motivation to use it, but not when handed-down models are slavishly copied.

Many of the schools' ETV systems that were copied from European or American models failed, but those that set out to use ETV to compensate for the lack of teachers and schools--a situation foreign to most industrialized countries--were more successful. The ETV system of Ceara sought foreign consultants and advisors in vain. Brazilians developed their unique system by themselves.

Technological revolutions take time and patience. The institutions established over centuries do not change in a day. Comenius introduced pictures in textbooks four hundred years ago, but it took some three hundred years for the idea to be generally accepted, and only in the last forty years has it come to anything like fruition.

We are in a demanding era of accountability and have linked evaluation to cybernetic models of feedback systems. We ask, "Does it work? Yes or No?" If the answer is no, we take an alternative line of action. The application of technological principles depends upon creative steps and leaps in the dark, both of which are alien to Systems Planning. We should be asking, "Does it work?" and be prepared to accept as an answer, "Not properly," and allow time and resources to think about the problem and try again.

Many of the media projects in education described in the previous essays failed or had no long-term impact because they did not persist. They tried a technique to resolve an educational problem. Many were partially successful, but then came up against obstacles or ran out of funds or became regarded as finished. They stopped or wound down. Meanwhile, the educational problem remained.

The introduction of little electronic teaching machines or the linking of schools to an interactive TV system is in itself no answer. The application of either will immediately give rise to a new unexpected generation of problems. It is with this area of applications research that LDCs need to be concerned. LDCs must be given the resources to study the new developing techniques, apply them, and to experiment with their ideas until they work.

One warning: technological revolutions cause social revolutions. In El Salvador the ETV project provoked a national teachers' strike. The students in the television schools of Northeast Brazil are passionate in their support of the system, but their parents are hostile. The more successful the television schools of Niger were, the more they created hostility among

conventional teachers. Murray Thomas provides a fascinating picture of the problems generated by the introduction of television in American Samoa.

Accepting foreign technological models is more likely to create social problems than is the creation of indigenous models. The gradual introduction of a technology via sensitive experimental projects that take into account the socialization of new forms of instruction is more likely to be harmonious than an attempt to change the total pattern of instruction at a stroke.

Recommendations

What, then, are the guidelines that can be suggested for the use of mass media in projects in education and development?

As a first stage of any major education project in an LDC, research should be set up to do the following:

- Develop possible forms of instruction that meet the qualitative and quantitative instructional needs of the LDC;
- Investigate systems for local and individual access to data banks.
- One way to meet these objectives would be to set up a research center in the LDC. This should:
  - Be concerned with principles and problems, adaptation and implementation, rather than with theory-related hypothesis testing and model adaptation;
  - Have management and research personnel who are natives to the country;
  - Be integrated with the educational system so that teachers and, in particular, trainee teachers are involved in the research, feel that they are part of the changes, and become excited about the prospects;
  - Be funded so that there is security and continuity over a long period of time. (Ten years at least would seem reasonable.) The Center should have the continuing capacity to buy "state of the art" equipment that embodies technological advances.

Initial funding for such centers could be relatively low. Basic equipment may be all that is needed in the first instance.

It should be recognized that costs will increase. Initial experience should be conceived as being on a trial-and-error basis. As a promising mode of operation is discovered, it will require more extensive field testing, more equipment, and more personnel training.

In due course, a country might commit itself to a technological development in instruction that would lead to the creation of a local manufacturing capability and the establishment of a national infrastructure.

While the future is being worked out, what of the present? Whatever the shape of the future, we shall continue to need places to learn and people to facilitate learning. The difference is that now the learning places need to be linked to electronic media and the learning facilitators do not need to be content specialists.

The building of schools, colleges, and training centers should take into account future developments. In terms of siting, they should be related to plans for the development of telecommunications systems, and, at the same time, telecommunications systems should be related to educational needs. Instead of being tailor-made for current modes of classroom teaching, school buildings should be designed so that later they can house a very different learning system.

Teacher training should be infused with an awareness of the pitfalls of massively expanding the use of conventional technology and of the dangers of creating in the future--as exists in industrialized countries today--a large body of frustrated unemployed teachers. Teacher training should concentrate more on methodology rather than content, and it should be shorter so that the investment of the individual in learning a profession is not so consequential to the teacher, and so that he can move to another profession if he must. Concentration on methodology should be linked to the socializing aspects of learning--encouraging group activities, cultural activities, community participation (the areas in which electronic media as yet offer few solutions). At the same time, trainee instructors should be introduced to electronic media so that they understand their role and their possibilities and feel involved in the new developments. They should be trained as managers, counsellors, and specialists in accessing information.

In terms of investment, it is possible to envision heavy investment now in building and training to create a basic network for the immediate future and diminishing real costs in the future as fewer and fewer people are trained and buildings are renewed rather than initiated.

Research and development, the building of learning centers, and the training of learning "facilitators" need to be integrated in terms of costing, planning, and coping with the social impact of educational change. This involves four steps.

Proportionate Investment

Expansion of schools/ learning centers & teacher training/ learning facilitators	Initial trial & error research projects	10 years
	Field testing of promising projects	
	Decision to implement	
Retraining & adaptation of schools to learning centers	Gearing up for national adoption	
(Buildings and instuctors	(Software and Hardware)	

First, there is an expansion of schools, which are adaptable as learning centers, and of a teaching force that is oriented to change. At the same time, research and development experimental stations are set up to search for appropriate applications of new media in instruction. Second, "teacher training" centers and new "schools" are involved in field testing new concepts of instruction, and the expansion of "schools" and "teacher training" begins to wind down to a level appropriate to the needs of the new ideas. Third, when a viable form of instruction has been developed that meets the needs of the country, a decision to implant it will be needed at the national level. Fourth, there is the development of the software and the hardware and, perhaps, the creation of a national manufacturing capability. The learning centers are adapted to accommodate the hardware, and the "learning facilitators" are retained to work with the new system. (This would, of course, be a more complex process in practice).

This outline primarily relates to the areas classified as "classroom teaching." It is in this area that future developments are more susceptible to national planning and in which loans from aid agencies can make a critical difference. The developments in on-the-job training and informal learning do not seem to warrant much intervention. Improvement of on-the-job training, as it relates to industrial development is motivated by powerful market forces. This is also true of informal learning. But increasingly, the technology is providing the means for self-interest groups at the national and community levels to take responsibility for what is taught. The "learning centers" derived from the old classroom concept could also provide the kind of resource for the motivated autonomous learner that public libraries supply.

There is an old adage in the transfer of technology: "Don't give a man fish--teach him to fish." That is all very well, but most people know how to fish and they know their river and their fish very well. If the fisherman is to get a new hook or rod, he must work out for himself whether it is any good in his country, on his river, with his fish, because he knows all of them better than any outsider does.

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